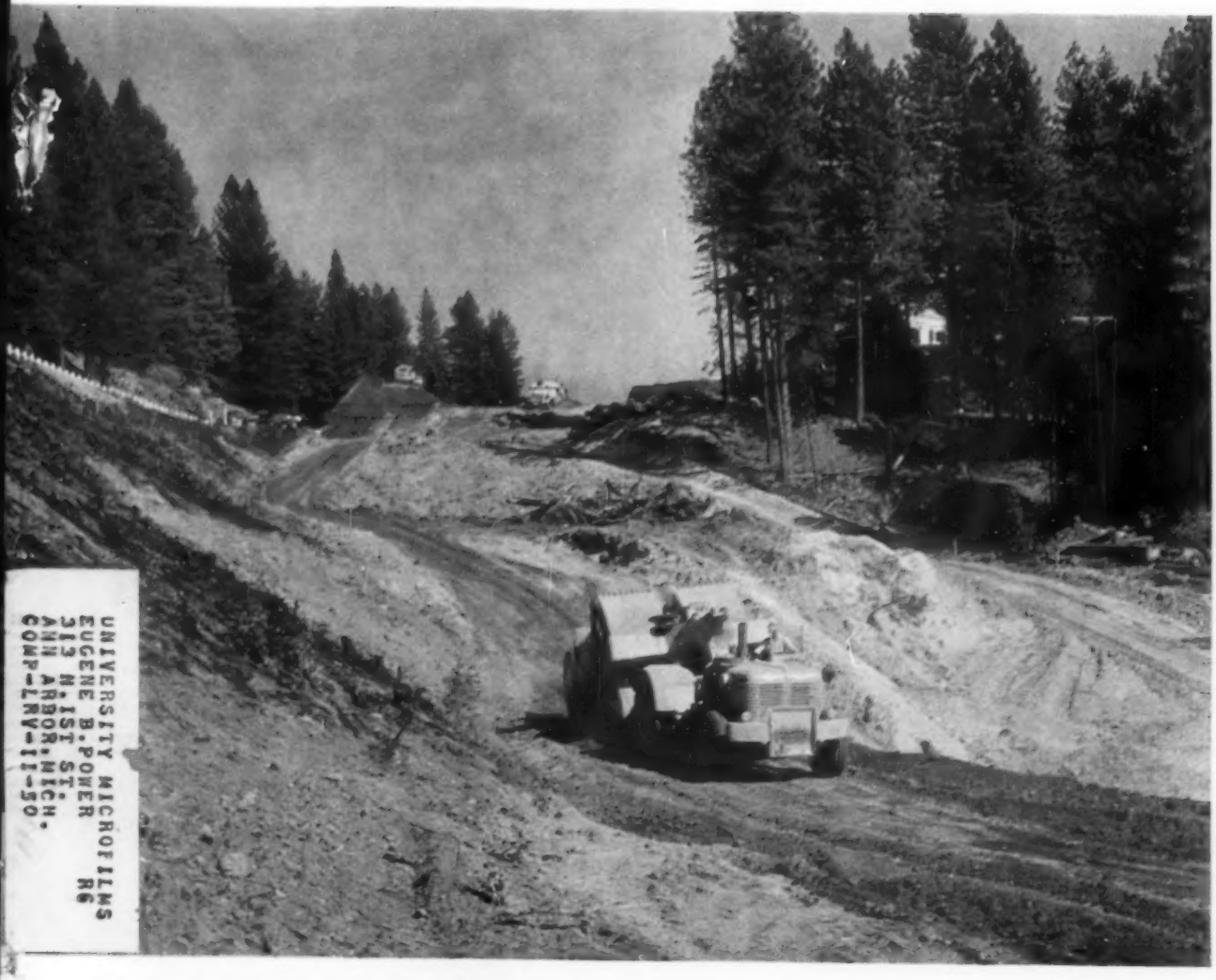
ROADS AND STREETS

March, 1960

A GILLETTE PUBLICATION



Cost Controls for the Ordinary Contractor

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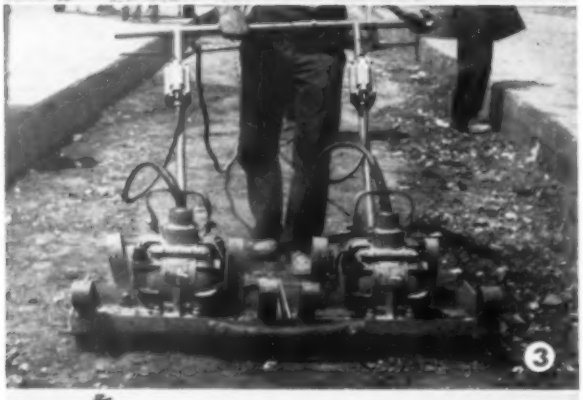

4 WAYS TO BETTER PAVING PROFITS

1 JACKSON VIBRATORY COMPACTOR
On any major paving project involving the compaction of granular soils, from sand to large rock, or soil-cement mixes the JACKSON MULTIPLE VIBRATORY COMPACTOR will save its cost in jig time. It's faster in attaining 100% specified density, more economical to operate and maintain, and has far greater job adaptability than any other machine. Vibratory units can be arranged to exactly fit the job — individual units manually operated to reach the otherwise inaccessible spots. The machine operates in either direction — no turning required; and each vibratory unit supplies 4200 3-TON BLOWS per minute.

2 JACKSON TRAILER COMPACTOR Employs the same vibratory units as the MULTIPLE (up to 6 in a single workhead, or 8 in two). May be pushed or pulled by any prime mover capable of working speeds as low as 50 FPM. Power plant supplies both single and 3-phase, 110-115 Volt, 60 Cycle, AC, and has many uses.

3 JACKSON MANUAL COMPACTOR Uses same vibratory unit as the MULTIPLE COMPACTOR. It's self-propelling, achieves 100% specified density of granular soil in 5" layers at rate of 400 sq. yds. per hour. One man can easily handle hook-up of twin units and double production. Trailer-mounted generator with compactor pick-up feature for universal operation is available. Perfect for a host of applications.

4 MUNICIPAL PAVING For jobs of this type, a JACKSON Vibratory Screed and Portable Power Plant is a very convenient, productive and inexpensive outfit. Strikes off to any crown, undercuts at curbs and side-forms, works right up to and around all obstructions. Two men easily handle it on all slabs up to 30 ft. wide. Rolls back for second passes on 4 rollers.

FOR SALE OR RENT AT YOUR NEARBY JACKSON DISTRIBUTOR
Name and literature on request.

JACKSON VIBRATORS, INC.
LUDINGTON, MICHIGAN

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You just can't beat it for strength and durability

Though it's so light that two men can easily handle a 14-ft length, pipe made of corrugated, galvanized Beth-Cu-Loy sheets is as tough and strong and long-lasting as any modern project will require. With Beth-Cu-Loy pipe, you get the strength of steel, the flexibility of steel, and steel's easy-to-handle light weight.

You also get the corrosion-resistance of steel which has been alloyed with just the right amount of copper, then coated with a heavy layer of prime Western zinc. The records show plenty of corrugated metal pipe installations which have lasted for 30, 40, even 50 years.

Because of its long lengths, Beth-Cu-Loy corrugated culvert pipe reduces the number of field joints, speeds up the laying. Large crews and heavy lifting equipment are unnecessary. The longitudinal flexibility of Beth-Cu-Loy pipe simplifies grading and alignment; transverse flexibility helps to distribute the loads peripherally.

Bethlehem manufactures only the Beth-Cu-Loy steel *sheets*—your fabricator will form them into pipe to meet your project's requirements. If you would like further details about Beth-Cu-Loy sheets or the pipe made from them, consult your local fabricator, or write to us at the address below.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
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ROADS AND STREETS March, 1960

HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

Accepted as Controlled Circulation Publication at Milwaukee, Wisconsin. Published monthly. Subscription $6.00 per year ($7.00 foreign.) Form 3579 requested to be returned to Gillette Publishing Company 22 W. Maple St., Chicago.

BIDS DON'T BACKFIRE

because of tire troubles... with Goodyear on the job

FINDING THE WORK FACTORS—Goodyear Big-Tire Specialists will analyze the problems of terrain, loads, climate, roads, schedules, speeds—everything that bears on tire needs and costs.

Then, from a complete line of *the world's toughest earthmover tires*, they'll recommend the most efficient and lowest-cost tire to do each job right. These tires, with a super-tough body built with 3-T Nylon Cord and specially compounded tread rubbers of unequaled toughness, cope with tremendous loads, endless flexing, cutting and chipping dangers—provide amazing durability.

PUTTING BIG-TIRE KNOW-HOW TO WORK—From the world's greatest fund of experience, Goodyear Big-Tire Specialists are uniquely qualified to help you. And they'll provide the best in tread and body designs to help safeguard your contract and your profits.

SETTING UP BIG-TIRE SERVICE—Goodyear Big-Tire Specialists will complete your tire-performance insurance by lining up, and even operating, a tire-maintenance program to save you BIG MONEY in man-hours, machine-hours and useful tire life. If necessary, Goodyear contractor service will travel with your job—handle all your tire maintenance and repairs.

With BIG TIRE PERFORMANCE
Example: SUPER HARD ROCK LUG

Here's a typical Goodyear big tire for big jobs—the new Super Hard Rock Lug (pictured). This wide-base off-roader has a new "square" shoulder design with extra-thick rubber for terrific traction bite and longer wear. Yet its cost is the same as ordinary wide-base tires.

Get in on all this—see your Goodyear dealer now! Or write Goodyear, Truck Tire Dept., Akron 16, Ohio.

WORLD'S TOUGHEST EARTHMOVER TIRES BY

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

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ROADS AND STREETS

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 68 years of continuous publishing in the highway field; combined with Engineering and Contracting and Good Roads Magazines, established in 1892.

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When this photograph was taken, 8,000 yards of right-of-way had been cleared of trees, and the roadbed was being prepared for surfacing.

"Sinclair Helped Cut Maintenance Costs On Every Mile of Our Northway Section"

says J. Hanna, Superintendent,
D. A. Collins Construction Company

The Northway, another link in the nation's grid of superhighways, connects the New York State Thruway with the Canadian border. Mr. Hanna says, "Our heavy-duty equipment took the toughest kind of punishment on this project. Work ranged from ripping out trees to building bridges. Yet our maintenance costs were far below what we anticipated. Much of the credit must go to Sinclair's service and their high quality fuels and lubricants. They kept our equipment operating at peak efficiency . . . *on schedule.* These are reasons enough why we use Sinclair Products exclusively."

If you haven't discovered the cost-cutting possibilities of Sinclair services and products, see your local Sinclair Supplier – or write Sinclair Refining Company, Contractor Sales Dept., 600 Fifth Avenue, New York 20, N. Y.

Sinclair
Fuels and Lubricants

Sinclair

Mr. Hanna reports, "The portable trailer tanks Sinclair loaned to us contributed greatly to the speed and efficiency on our section. We were able to refuel on the job . . . **fast,** and keep our equipment working **full time.**"

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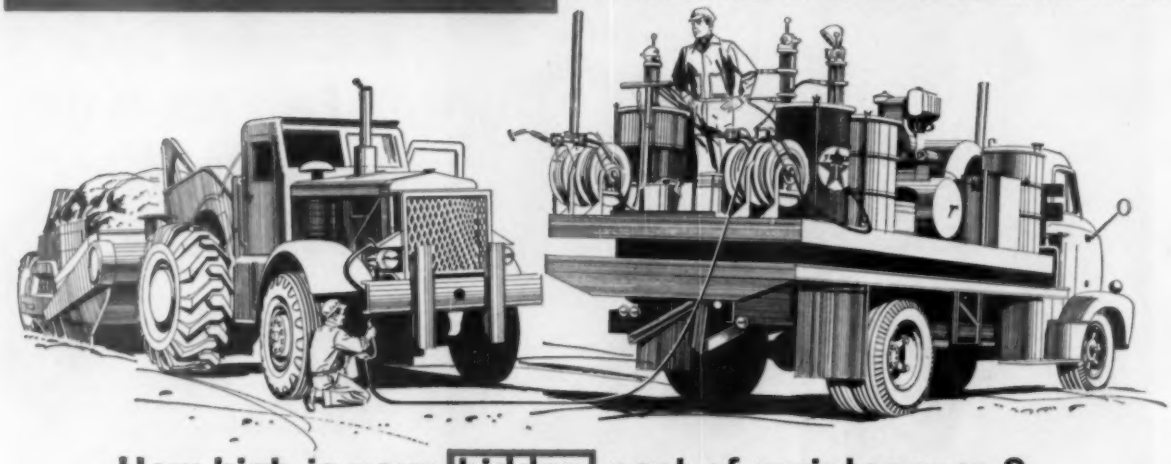
LUBE LOGIC

Six tips to

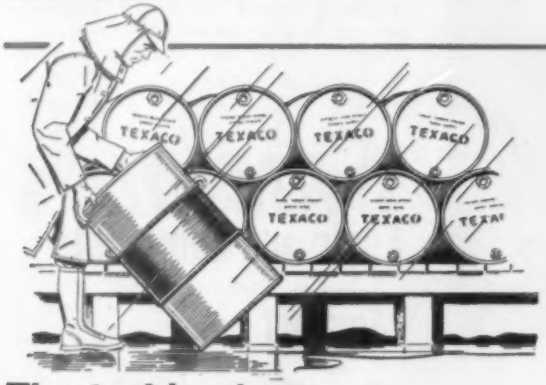


How high is your hidden cost of maintenance?

You may not realize how many extra maintenance dollars you spend when you keep many different lubricants on hand. (Six are often all you need to cover all major maintenance.) You pay extra for inventory. You pay extra for storage and handling. It costs you more in paperwork to order. And you'll have to figure the wasted cost of equipment parts and downtime if misapplication should occur.

The Texaco Lubrication Plan helps you reduce or even eliminate these hidden costs. That's because it provides the minimum number of *proven* multi-purpose and special lubricants, tailored to your job requirements.

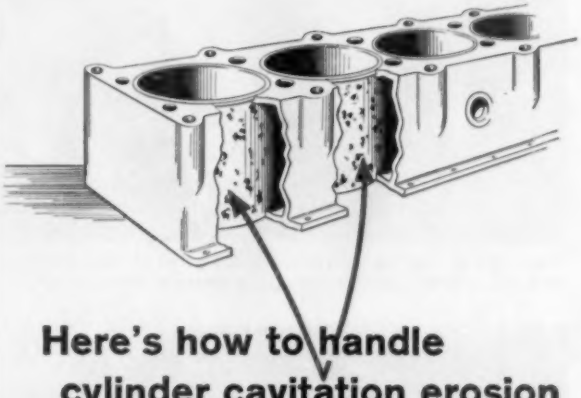
You'll do yourself a favor when you check with a Texaco Lubrication Engineer. He'll carefully plan your lubrication needs—then follow them up to see that your lubrication problems are taken care of fast.



The inside story on outside storage

You're short-changing yourself if you skip these simple precautions: drums stored outdoors should be placed on their sides. When stored on end, expansion and contraction through temperature changes can suck in rain water that collects on top of the drum.

Want to warm up lubricants that have become stiff from cold? *Don't* heat them with an open flame. You might melt the sealing compounds, and the drum will leak. You might also damage the product with too much heat in one spot. Put the drum indoors for a while before using.



Here's how to handle cylinder cavitation erosion

High pressure cooling systems in use in most supercharged diesels are subject to coolant aeration. This aeration can cause cavitation, leading to serious cylinder liner corrosion-erosion, unless a rust preventive is added to the water. A good antifreeze (like Texaco PT antifreeze) will do the job in winter—but in summer a 1% to 2% solution of Texaco Soluble Oil C will do a fine job. (Remember to flush out before you add antifreeze again.)

cut maintenance costs

OIL GAUGES SPEAK A LANGUAGE ALL THEIR OWN

Look to your oil gauge pressure for clues to a variety of potential engine ailments. For example:

LOW OR NONE

1. Oil pump pickup stuck high.

LOW

1. Clogged oil pump screen.
2. Excessive main, con-rod, camshaft or rocker-arm bearing clearances.
3. Clogged full-low filter, if by-pass isn't working.
4. Excessive dilution of oil with fuel.
5. Enlarged squirt holes.
6. Loose connections or cracks in oil line.

LOW OR ERRATIC

1. Faulty oil pump.
2. Restriction in oil pan, or oil too viscous to keep oil pump intake supplied.

LOW OR HIGH

1. Faulty gauge.
2. Ineffective oil cooler depending on type, may keep oil too cold or provide insufficient cooling.

HIGH

1. Oil with viscosity too high for climate.
2. Sludge and contamination in the oil.
3. Clogged oil passages on the pressure side.

HIGH, LOW OR ERRATIC

1. Improper setting or failure of pressure relief valve.

ERRATIC, LOW, THEN NONE

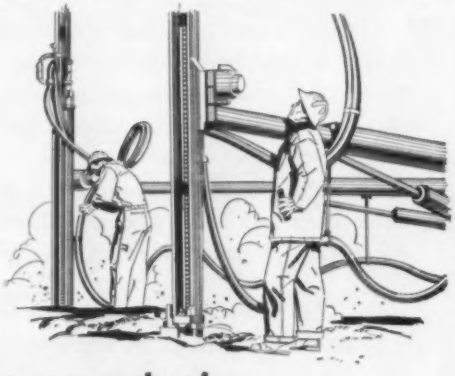
1. Crankcase oil level just at or below oil pump pickup.

NO MOVEMENT OR DELAYED ACTION

1. Clogged line to gauge.

Don't let engines foul up!

If the fuel injector on a diesel drifts off or "dribbles," incompletely burned fuel will contaminate the crankcase. The result will be plenty of smoke—and probably engine trouble. The injector should be fixed immediately—but if it can't be, start shortening drain periods to remove the damaging oil-fuel mixture. Also, use an oil with full detergent and dispersion properties to keep other undesirable products out of the engine.



New product for rock drill couplings

Actually, it's an old friend, Marfak Heavy Duty #2, in a new application. According to the raves from customers who've tried it, the lubricant works better on rock drill couplings than anything they've ever used.

TEXACO LUBRICATION ENGINEERS

Every month or so we'll bring you a batch of "sleepers"—little angles, so easy to overlook, where big savings in time and money can be made. But month in, month out, your local Texaco Lubrication Engineer is the best source of money-saving lubrication ideas. Don't forget that "Lubrication is a major factor in cost control." Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

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Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

TEXACO

Throughout the United States

Canada • Latin America • West Africa

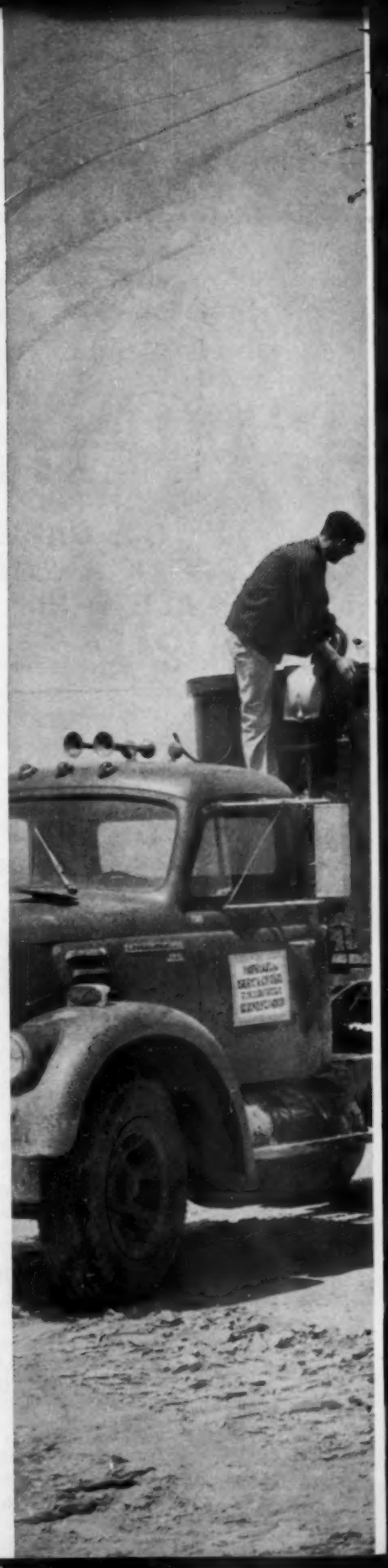
LIKE A LOADER WITH EXTRA REACH?

The TL-20 has it! Means fast, even dumping into high-sided trucks—no wasting time leveling material to distribute it evenly.

That extra foot or two of reach that you get with a TL-20 tractor loader makes a big difference in your output. You clip valuable seconds from work cycles by dumping loads right into the center of high-body trucks. No time-consuming loading from both sides . . . no pitching . . . no wasting time dozing to distribute material evenly—and no banging up truck and loader.

Other exclusive advantages include: *Faster Shifting*—one lever controls both forward-reverse and all speeds. *Greater Stability*—easier loading, less spillage, more operator comfort. *Strong, Pin-Connected Axles* prevent rolling and shifting of axles under load. Your Allis-Chalmers dealer can show you other tractor loader advantages that bring extra production on excavating and loading work. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

TL-20—6 buckets, from 2¼ to 5 cu yd • 130-hp diesel • 23,250 lb • 9,000-lb. carry capacity



move ahead with

ALLIS-CHALMERS

power for a growing world

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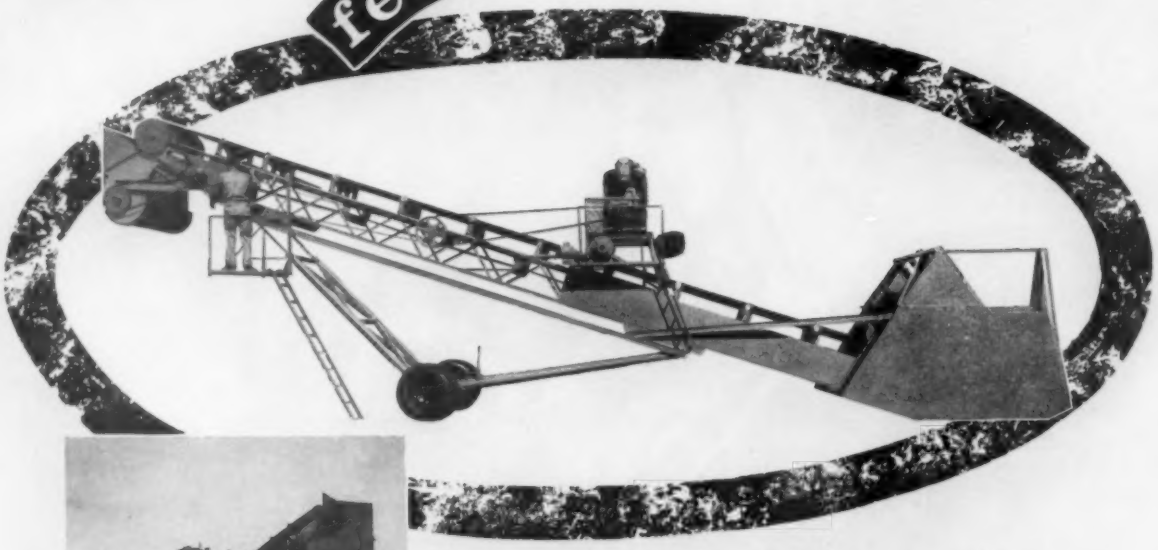
ALLIS-CHALMERS
TL 20

pugmill
feeder trap
conveyor
feeder

4-in-1 VERSATILITY
IN THE
TRAVELER



A Portable, Single-Shaft Central-Mix SOIL STABILIZATION Plant by BOARDMAN

This portable stabilization plant offers you four-in-one versatility, yet it requires just *one* power unit, just *one* prime mover, just *one* control operator!

Move the Traveler into place and be in operation in just over one hour. Convert it quickly to serve your specialized requirements: remove the pugmill for a portable conveyor-feeder, remove the feeder and trap for a belt-conveyor on wheels. And its progressive BOARDMAN design gives you up to 400 tons of stabilized base every hour—top capacity at competitive prices!

Send a post card today for complete specifications, prices and technical literature by return mail. The Traveler is waiting to help you!

BOARDMAN
THE BOARDMAN CO.
1401 S.W. 11th • OKLAHOMA CITY

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Seven-foot IH Bullgrader is raised, lowered, angled, and tilted hydraulically—with complete control of all actions from the tractor seat.

The exclusive International Drott 4-in-1 combines standard ¾ cu yd bucket, plus clamshell (shown), carry-scraper, and bulldozer, all in one machine.

Big tractor brawn...budget priced!

Now you can have International® tractor power and rugged dependability in a small, low-cost crawler! It's the International T-340 . . . leading its field in power, speeds, and stamina.

The husky four-cylinder engine delivers 31 drawbar hp . . . up to 6,400-lb drawbar pull while giving the best fuel economy in its class. Trigger-quick governor responds instantly to sudden load demands. Power train and track assembly are designed to big tractor specifications for long, trouble-free life.

For heavy drawbar pulls, you can equip the T-340 with Torque Amplifier for 10 forward speeds . . . let the operator boost pull-power up to 45% without shifting, *on-the-go*, in any gear. Or, specify Fast-Reverser in place of TA . . . get five speeds coming and going to speed up all shuttle-type work.

Handle all those scattered, small-yardage jobs with greater economy . . . greater profit . . . by giving them all to the sturdy, hustling T-340. A wide range of matched-to-tractor equipment fits the T-340 to many of the jobs now assigned to larger, more costly power. Ask your IH dealer for a T-340 demonstration!

See your INTERNATIONAL HARVESTER dealer

International Harvester Products pay for themselves in use—Farm Tractors and Equipment . . . Twine . . . Industrial Tractors . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois.

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If you use rear-dump haulers

Backed by better than 25 years of specialized experience in building off-highway earthmoving equipment exclusively, Euclid's modern rear-dump line incorporates advanced engineering that is a result of unmatched field experience. From the 10-ton Model R-10 to the big 55-ton "Euc" with two engines and a total of 672 h.p., Euclid Rear-Dumps are job proved to meet today's requirements for big performance. This greater dimension... in range of capacities, in choice of engines, transmissions and tire sizes, and in type of hauler... and in parts and service facilities of a world-wide dealer organization, too... can mean lower hauling costs and more work-ability on every one of your rear-dump jobs.

Have the Euclid dealer in your area give you facts and figures to compare with your own hauling costs... you'll find Euclid's greater dimension pays off in a better return on your investment. EUCLID Division of General Motors • Cleveland 17, Ohio

Payload capacities of 10, 15, 18, 22, 27, 40 and 55 tons... also semi-trailer models of 12, 22, 35 and 50 ton capacity.

When you compare Rear-Dump Haulers, check these 7 points...

- is maker experienced in the field... known for building a dependable, well-engineered product?
- does machine have required performance ability needed... capacity and speed for high production work, power and traction for rough going and steep grades?
- well-balanced for size of loading equipment... hoppers and controlled dumping needs?
- is there good parts and service availability... at both manufacturer and dealer level?
- are maintenance manuals, parts books and service literature complete... is machine designed for easy servicing?
- is machine easy to operate... convenient controls... good visibility... operator comfortable so that efficiency is maintained for entire shift?
- can required production be maintained at low cost... construction rugged enough to withstand heavy service with minimum maintenance?

Euclid Rear-Dumps meet every one of these important requirements... and more!

...check

EUCLID'S GREATER DIMENSION

BIG POWER . . . BIG CAPACITY . . . BIG PERFORMANCE

Model R-27 has heaped capacity of 26½ yds. . . . rated payload is 54,000 lbs. . . . available with Cummins 335 h.p. or GM 336 h.p. engine . . . 4-speed Torqmatic Drive with converter lock-up and Torqmatic Brake . . . dual hydraulic booster steering . . . 18.00 x 25 tires on all wheels . . . rugged body with twin hoists . . . top speed with full payload, 34 mph. . . . available in two body types, standard for all-around use and quarry for hauling big rock.

ENGINEERED FOR EASY SERVICING

Like other Euclids, the R-27 is of simple, rugged design for years of dependable performance at minimum maintenance cost. When repair or replacement of major components is necessary, service-minded engineering saves time and money, too. For example, a transmission can be removed and replaced in just one-eighth the time required for the same work on a competitive hauler of the same capacity . . . engine replacement takes only one-half as many man-hours.

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GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE


Bold new Link-Belt Speeder
truck-crane ratings
...your best cost/capacity

Now with Link-Belt Speeder, you can move up in machine capacity without a price penalty . . . handle bigger loads at extended boom radii!

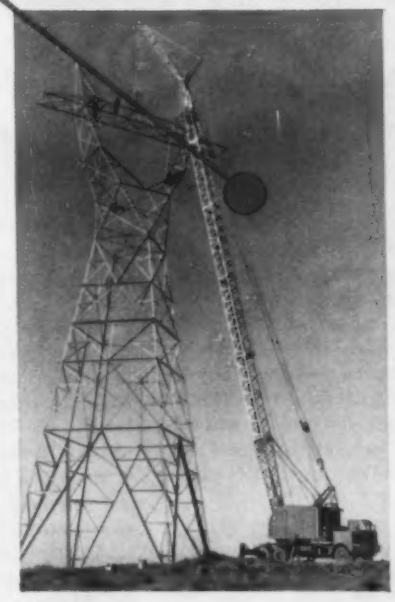
buy

HC-78A (30-ton rating)
A 30-ton truck-crane at 25-ton cost . . . 8' wide.

Capacity*
100' boom at practical 30' working radius . . . 18,500 lbs.
100' boom at practical 50' working radius . . . 8,170 lbs.
* *with outriggers set*

HC-98A (35-ton rating)
At extended boom radii — where the big share of truck-crane profits are made — you out-ton, out-profit competitive rigs. But you pay nothing extra!

Capacity*
100' boom at practical 30' working radius . . 24,980 lbs.
100' boom at practical 50' working radius . . . 13,060 lbs.
100' boom at practical 60' working radius . . . 9,900 lbs.
* *with outriggers set*



HC-108A (40-ton rating)
Handles lifting capacities at extended boom radii formerly reserved for 45- and 50-ton rigs. Your cost is still 40-ton truck-crane dollars!

Capacity*
100' boom at practical 30' working radius . . 31,920 lbs.
100' boom at practical 50' working radius . . . 16,960 lbs.
100' boom at practical 60' working radius . . . 13,000 lbs.
100' boom at practical 70' working radius . . . 10,340 lbs.
* *with outriggers set*

Greater lifting capacities without a cost penalty is Link-Belt Speeder's newest contribution to truck-crane ratings. Look over the line-up of capacities at the right . . . see why only one line of truck-cranes *reaches out* for bigger profits.

New accuracy, new safety, too, with exclusive Speed-o-Matic power hydraulic controls: independent rapid boomhoist for power-raising and power-lowering of boom; power-controlled load-lowering clutches for either or both main drums.

FAST STRIP-DOWN

Exclusive Full-Function Design provides separate power flows for each machine operation with every and all functions *completely independent!* Strip-down for legal highway travel (when necessary) as fast as 45-min. on bigger rigs.

Have your Link-Belt Speeder distributor pinpoint your best cost/capacity buy. For detailed catalogs of truck-cranes in the 10- to 40-ton capacity range, write LINK-BELT SPEEDER CORP., Cedar Rapids, Iowa. 112-59N

LINK-BELT SPEEDER

It's time to compare . . . with a Link-Belt Speeder

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Digs and stacks 2,000 yds. an hour at "impossible" speeds...on 349 Timken® bearings

Weighing in at 2½ million lbs., this giant Bucyrus-Erie wheel excavator knocks out previous records for this type of equipment. It can dig and stack 2,000 yds. of over-burden an hour. And the stacker conveyor belt speed—1,000 fpm—was believed impossible to achieve for this type of service.

To take the extreme loads on the main wheel drive—heart of the machine—Bucyrus-Erie uses three Timken® double row tapered roller bearings. Two more are on the conveyor drive. And 344 Timken bearings roll the loads at other critical points. Timken bearings work better because . . .

1) *They take all loads.* Their taper lets Timken bearings take all radial and thrust loads. And full-line contact between rollers and races provides extra load-carrying capacity when needed.

2) *They practically eliminate friction, reduce maintenance.* Timken bearings are geometrically designed and precision-manufactured to roll true. And because they hold shafts concentric with their housings, Timken bearings make closures more effective in keeping lubricant in, dirt out, maintenance down.

Also, you get the *extra* advantages of Timken Company leadership such as service from graduate engineer salesmen qualified to work directly with your purchasing, engineering and production people. Service backed up by advanced research and testing facilities unique in the bearing industry.

When you buy Timken bearings you get . . . *1) Quality you can take for granted. 2) Service you can't get anywhere else. 3) The best-known name in bearings. 4) The pace setter in lower bearing costs.* The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.*

BETTER-NESS rolls on

TIMKEN®

tapered roller bearings

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ROADS AND STREETS
Sixty-Six Years of Editorial Leadership

Washington News Letter

By Duane L. Cronk, Director, Highway Information Services, Inc.

March 10, 1960

After a tedious series of interrogations, the Blatnik committee hearings blew up in a hot exchange of political charges and counter charges last month. The committee has been reviewing a decision to raise the clearance of structures on the Interstate System, from the original 14 ft. to 16 ft., a design change requested by the Defense Department. Chairman John Blatnik, D., Minn., set out to reveal that the Administration had dallied three years, six months and ten days in making such a decision, during which time more than 2,000 affected bridges were built.

"This was unconscionable, incredible, inexcusable and indefensible delay," the Congressman declared, with the result that "millions and millions of dollars" have been wasted.

This "classic example of bureaucratic indecision," he charged, has turned the Interstate System into "a gigantic obstacle course of thousands of substandard underpasses" which will strangle the cross-country mobility of military units.

* * *

The military had first decided that 17-foot clearances were an absolute minimum, then back-tracked to 16 ft. when the Department of Commerce pointed out that the substantial cost increase necessitated by defense requirements might have to be paid for out of the defense budget. The American Association of State Highway Officials had formally agreed to go along with the 17-foot clearance, in the meantime. The result was that for a few weeks state highway engineers around the country were designing to three different standards under conflicting instructions.

As for the cost to correct the damage, it appears now that a 16-foot clearance requirement will add only about $195 million to the construction cost of future overhead structures. To raise existing bridges would cost another $730 million. This may not be done.

The investigating committee chairman and his counsel spent days during the hearings to retrace the course of internal notes, unsigned letters, and other incidental memorabilia in an attempt to establish that it took the Department of Defense a long time to make up its mind on the subject.

Challenging the chairman and committee counsel at every opportunity, Congressman Gordon Scherer, R., Ohio, seemed determined to minimize any political gain the hearings might produce for the Democrats. He was handed a golden opportunity on a silver platter at the close of the sessions, when Chairman Blatnik pulled out a mimeographed statement summarizing his conclusions immediately after the last two -

(continued on next page)

and most important witnesses for the Administration - had finished testifying. The fact that Mr. Blatnik had some very harsh conclusions obviously before hearing Federal Highway Administrator Bertram Tallamy and Assistant Secretary of Defense Perkins McGuire, indicated that the whole investigation had been set up to embarrass the Administration, Mr. Scherer and other Republican members charged.

* * *

State highway departments are unhappy over instructions received from the Bureau of Public Roads written to help them make their new estimates for cost of completing the Interstate System. It appeared that the Bureau was cutting design criteria - in number of lanes to be permitted, frequency of interchanges and other features. For examples, interchanges may not generally be considered more frequently than every two miles in urban areas, four miles in suburban areas, and eight miles in rural areas.

(In making the 1958 estimate, state engineers planned interchanges on the basis of not more than one per mile in urban areas and one per three miles in rural areas. Apparently, a great number of these will have to be re-evaluated and "justified" under the new instructions.)

The number of traffic lanes, also, will be restricted under the new criteria for estimating purposes. These will be governed by a new standard - 1960 population. No more than four lanes may be considered on a facility serving a city currently under 400,000; no more than six lanes for cities of 400,000 to 1 million; and no more than eight for cities of more than 1 million. There may be no consideration for transit services on urban expressways.

* * *

Senator Albert Gore, D., Tenn., charged in a Bureau of Public Roads appropriations hearing that this is a step to cheapen the Interstate System. Other Congressmen see it as a back-door move by the Administration to reduce the cost of the network, particularly in urban areas.

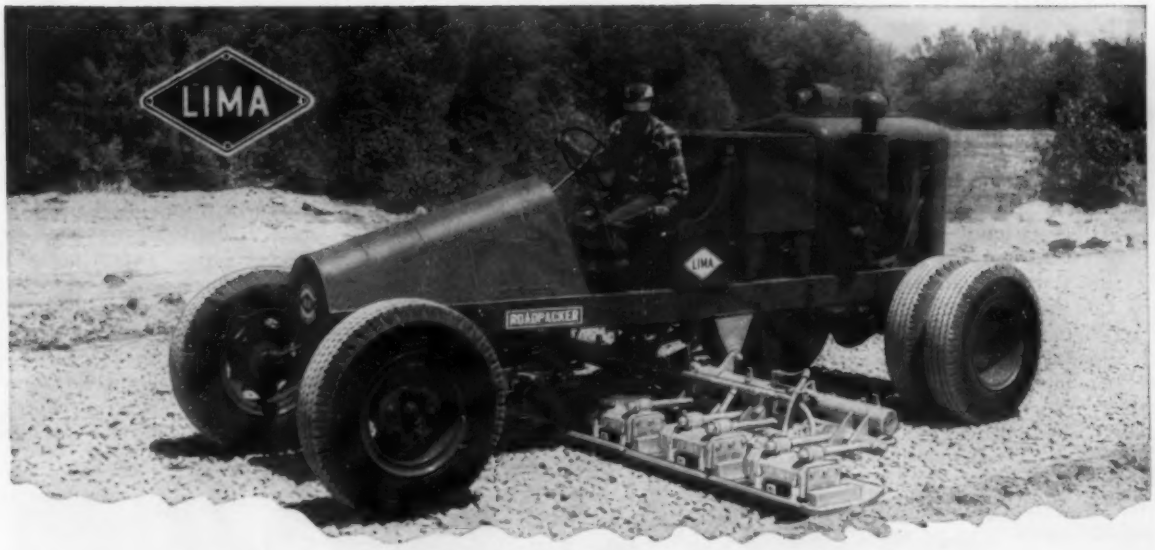
Not so, the Bureau of Public Roads retorts. Mr. Tallamy stated unqualifiedly that the new manual was written in these terms to expedite administration of the program. Expressways may be designed to higher standards whenever the state can justify their need, he said. Of course, the Bureau will insist on "complete documentation" and the decision on each project will be reserved for the Washington office. In other words, the Administration doesn't mean what it says, but the states had better listen, anyway.

Officials are determined that the new cost estimate must not show a new rise.

* * *

A committee of governors descended on Washington last month to protest the inadequacies of the Highway Trust Fund and contract controls. They proposed a number of measures to strengthen the Fund by $1.1 billion, all of them sensible, but none of them acceptable even for serious discussion this session.

By the time this is read, Chairman George Fallon of the House Subcommittee on Roads will have opened hearings on his bill to authorize new funds for the ABC Systems. Mr. Fallon wants to provide $925 million annually fiscal years 1962 and 1963, to be matched 50-50 by the states. The total - $3.6 billion in new money. The Administration is expected to testify against continuation of a program in excess of $900 million yearly.



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Compacts Fast, Wide and Deep on Macadam, Gravel, Crushed Rock, Sand, Soil Cement and Stabilized Bases

SAVE WITH SINGLE COURSE CONSTRUCTION

Lima Roadpackers meet the challenge—no other vibratory compactor gives you so many cost-saving job-speeding features . . . the reason why Lima Roadpackers are preferred by contractors throughout the world for fast production on highway and airport construction jobs.

Compare these profit-making features!

Heavy Vibrators

Six 437 pound vibrators deliver earth-shaking vibrations for deep, uniform densities. Vibrator units are completely sealed—no external moving parts. Vibrators are self-lubricated and need no daily maintenance. Required densities are quickly achieved. Macadam rock is tightly keyed, with screenings vibrated into voids in only three applications on most jobs. Compacts up to 600 tons per hour.

Infinite Speeds

20 feet per minute to 30 miles per hour! A fluid motor propels the machine while compacting. A dial selector gives compaction speeds to match any job including new high production requirements within a broad range of 20 to 95 feet per minute. Roadpacker can be anywhere on the job at a moments notice. Heavy duty transmission provides fast highway travel speeds to next job.

One Lever Instant Reversing

Compacts forward or reverse with one lever control—no gear shifts—no declutching—no stopping. With the Lima Roadpacker you have no lost time and no depression in the material being compacted when machine is reversed.

Variable Working Widths

End shoes fold back for a selection of 4, 5 or 6 shoe working widths. Easily folded by the operator alone, the Roadpacker carries unused shoes ready for wider working widths at any time. Folded end shoes permit Roadpacker to travel over highway.

Controls Up Front

Roadpacker controls are all grouped at operator's seat—engine gages and controls are mounted on dash panel. Foot accelerator in addition to hand throttle provides natural roading of Roadpacker.

Widener Attachment

Extension arm works shoes in a widening trench to 11" below the existing pavement. Quickly adapted to various width widening work; replaces trench rollers.

These are only a few of the advantages incorporated into the new rugged Lima Roadpacker, Model D. For complete information, see your nearby Lima distributor, or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

LIMA

Shovels—to 6-cu. yd.
Cranes—to 110-tons
Draglines—variable

LIMA SUPER ROADPACKER

For the large construction jobs such as superhighways, air bases and earth-fill dams, Lima offers the Super Roadpacker with two rows of six hydraulically controlled vibratory shoes. Compacting widths up to 15 feet.

LIMA AUSTIN-WESTERN

Crushing, Screening and Washing Equipment

LIMA Construction Equipment Division, Lima, Ohio

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Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing, Screening and Washing Equipment

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People

Cement Association Sets Up "Paving Bureau"

The Portland Cement Association has announced the merger of its Highway and Municipal and Soil-Cement bureaus into a single Paving Bureau at its general office in Chicago. Gordon K. Ray, former manager of the Highways and Municipal Bureau, is manager.

The new bureau will provide engineering service and developing technical and promotional information on both concrete and soil-cement pavement. G. Donald Kennedy, Association president, said that this integration of personnel and facilities will result in greater coordination and concentration of effort.

Soil-cement, a tightly-compacted mixture of soil or roadway material, portland cement and water, was developed in 1935 after long research and engineering study. Since that time, some 295 millions sq. yd., or the equivalent of 21,000 miles of 24-ft. wide soil-cement pavement has been laid in the U. S.

Gordon K. Ray

PCA Advances Two Research Engineers

The Portland Cement Association has appointed Ivan L. Tyler as research counselor in its research and development division. He has been succeeded as manager of the field research section by Paul Klieger, formerly senior research engineer.

As research counselor, Tyler will be freed of administrative detail so that his exceptional experience and training in concrete technology may be more fully applied to advanced research and counseling.

Mr. Tyler will continue as secretary, advisory committee, Long-Time Study of Cement Performance in Concrete, the Association's largest research project.

C. E. PROUDLEY, head of the Department of Materials and Tests, North Carolina state highway and public works commission, has retired after 24 years of service with the commission. He plans to enter private business.

Continued on page 25

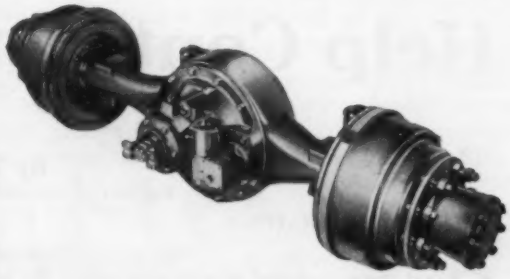
IN EATON 2-SPEED AXLES

REDUCES STRESS AND WEAR

ADDS TO AXLE LIFE • CUTS MAINTENANCE

KEEPS TRUCKS ON THE JOB • LOWERS OPERATING COST

Eaton's exclusive planetary construction distributes gear-tooth loads over four "planet" gears, holding stress and wear on any one gear tooth to a minimum. Completely locked out in the high speed range, these four gears rotate only slowly in the low speed range. The result is quiet operation, easy clash-free shifting, minimum wear, materially longer axle life. This rugged planetary design, plus forced-flow lubrication enables Eaton 2-Speeds to establish outstanding performance records. Eaton 2-Speeds also reduce stress and wear on engines and all power transmitting parts; they make it possible for trucks to haul more, quicker, longer, at lower cost.



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PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Hydraulic Pumps Truck and Trailer Axles • Truck Transmissions • Permanent Mold Iron Castings • Automotive Heaters and Air Conditioners Fastening Devices • Cold Drawn Steel • Stampings • Forgings • Leaf and Coil Springs • Dynamatic Drives and Brakes Powdered Metal Parts • Gears • Variable Speed Drives • Speed Reducers • Differentials • Centralized Lubrication Systems

Contractor supervisory personnel pose for photo at 1959 conference on highway construction practices, conducted by Ohio State University under Emmett H. Karrer, Professor of Highway Engineering, in cooperation with the Ohio Contractors Association. Topics covered included: supervisors' responsibilities; use of plans and specifications; construction surveying; equipment management; job safety; labor regulations; concrete, asphalt, other field methods.

The New Contractor-Engineer Relationship—One of a Series

Faster Field Decisions Help Contractor Workmanship

By Edison W. Ellis
Engineer of Construction, Ohio Department of Highways, Columbus

Good inspection and quality control on the job make up one of our most basic needs in the highway program. Each state highway department has its own methods of attaining this objective.

Basically, our efforts in Ohio have been directed to speeding up controls in order that contractors' operations will not be delayed. This not only involves field tests but also decisions as to what will be done as a result of those tests.

The Ohio department works through 12 geographical divisions. Each division operates training schools for inspectors and other project personnel during the winter season, as conditions permit. In these schools the specification requirements and testing procedures are reviewed, both for the benefit of experienced as well as new personnel. Basically, these tests involve soil compaction procedures and concrete control tests. The training meetings are conducted mainly by division personnel, supplemented by various staff specialists from the central office.

Our laboratory schedules training programs each year for Bituminous Plant Inspectors, as well as Concrete Control personnel. These meetings take place in our Columbus Laboratory, with department personnel serving as instructors.

1. We believe that good quality control on the project depends on an effective chain of command. In Ohio the primary responsibility for handling contract construction operations is vested in Divi-

Continued on page 99

People

Continued from page 22

G. GUY OWENS, procurement manager for the construction department of Merritt-Chapman & Scott Corporation, died recently at age 67. He had been associated with the firm since 1927, successively a field office manager, purchasing agent and contract controller before assuming the procurement post.

During World War II, Mr. Owens served as chief purchasing agent and contract controller for the Advanced Base Division, Navy Bureau of Yards and Docks, for which he received a Meritorious Civilian Service Award.

AARON A. PIERSON has been elected executive vice president of Fruin-Colnon Contracting Company, St. Louis. He was formerly manager of the company's Western Division.

Other Fruin-Colnon move ups—Donald M. Koch and Martin F. Leonard, vice presidents, are elected to the board.

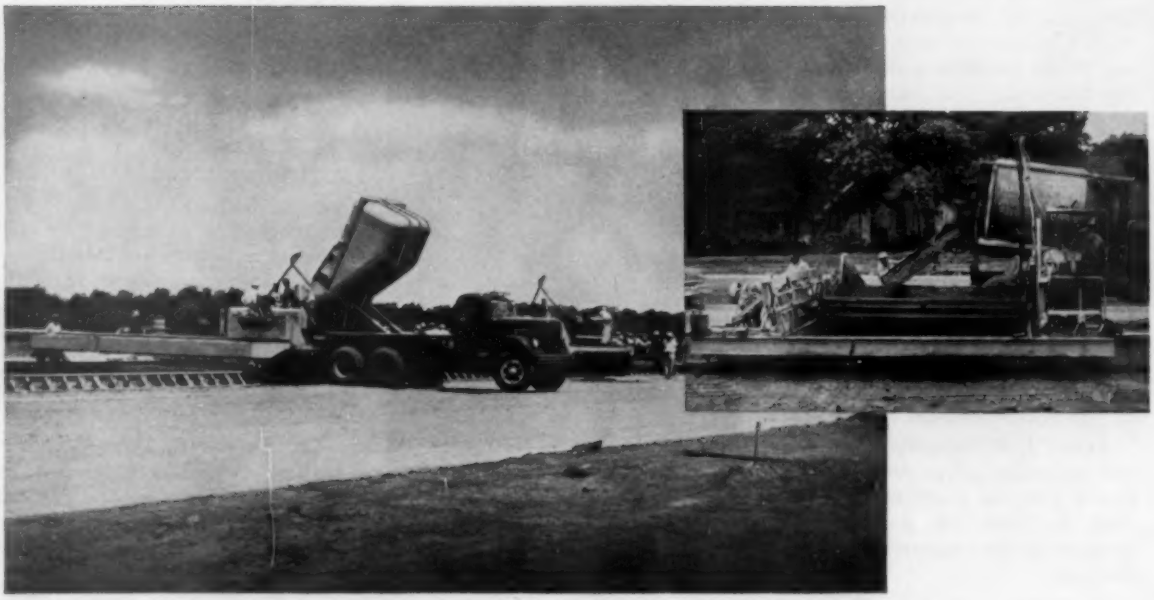
Aaron A. Pierson

JOHN W. VICKERY who recently became state highway engineer of California after 42 years with the organization, died unexpectedly. He was 67 and had held the new post only 2 months.

S. O. LINZELL has resigned as deputy director of operations, Ohio department of highways, and is rejoining Michael Baker, Jr., consulting engineers, as a mid-west engineering representative. Mr. Linzell first became associated with the Baker firm in 1957 after having served as Ohio highway director for 4½ years.

DR. ALFRED C. INGERSOLL, civil engineer, with the California Institute of Technology the past ten years, has become dean of the School of Engineering, University of Southern California.

HOW TO CUT COSTS EVERY TIME YOU PAVE WITH CONCRETE



You'll save time and labor...regardless of yardage handled...with the 30-second-spread cycle of Maxon Dumpcrete Concrete Spreaders

15 seconds to spread... 15 seconds to move and strike-off. That's the fast 30-second cycle of Dumpcrete Spreaders that cuts paving costs whether you lay an airport runway or widen a city street.

One man operates the Dumpcrete Spreader... places 180 to 260 cu. yds. of concrete per hour—full depth, base course or top course. Hydraulic controls simplify operation. Widths are adjustable from 11 to 16′ or 20 to 25′, depending on model. And the Dumpcrete Spreader handles concrete of lowest possible slumps.

Team the Dumpcrete Spreader with Dumpcrete Bodies, and you'll get all the cost savings possible through central mixing with non-agitated hauling. Or—use the spreader with transit-mixers to reduce time and labor costs for concrete placement. Contractors proved last season that you can save time and labor either way!

Find out how you can step-up hourly production with the Maxon Dumpcrete Spreader and Dumpcrete Bodies. Send the coupon for catalogs today, or call your Dumpcrete distributor.

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Geared by Fuller with off-highway '1220 Series Transmission . . .

Faster work cycles with countershaft brake and longer life with pressure filtration system

Eight Allis-Chalmers TS-260 Scrapers with Fuller off-highway '1220 Series Transmissions are boosting profits for Ben Haskins Construction Company on Oklahoma highway projects. All 8 of Haskins' '1220 Series Transmissions are equipped with Air-Powered Countershaft Inertia Brakes and Pressure Filtration Systems for the gear oil.

President Ben Haskins says, "Fuller '1220 Transmissions have helped make our operation more profitable. They're trouble-free. The transmission countershaft inertia brake permits quick, easy upshifts without double clutching. Faster shifting gives us faster work cycles . . . the pressure filtration system for the gear oil prolongs gear and bearing life . . . I'll insist on both the brake and the pressure filtration system when I buy equipment in the future."

For long life, easy shifting and positive lubrication in your scraper operations, specify Fuller off-highway Transmissions which include the countershaft inertia brake and pressure lubrication and filtration systems as standard equipment. Ask your dealer about these new features designed to provide *you* with a better margin of profit.

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FAR AHEAD OF ANY MACHINE IN THIS CLASS

Full of exclusive features for better performance

More Power: 77½ hp heavy duty engine provides more power than any comparable machine.

More Dumping Clearance: 8'-½" clearance under bucket edge, dumped — even more than some larger machines.

More Reach: 32" dumping reach ahead of front tires — twice the reach of any comparable machine.

More Reliable Brakes: 4-wheel hydraulic brakes instead of 2-wheel for equal braking forward or reverse. Sealed to keep out dust and dirt. Separate parking brake on drive shaft.

Full Power-shift Transmission plus torque-converter: Provides three speed ranges in each direction. All shifts in either direction can be made "on-the-go" with a flick of the fingers. No need to stop for any "range" shifts.

More Operator Visibility: New slope-down front end styling gives the operator full vision of the bucket digging action without leaning over the side.

More Safety: All boom structures are positioned ahead of and away from the operator. Standard ladder with hand rails makes it easy and safe for the operator to get on and off.

Closed, Pressure-controlled Hydraulic System: Oil reservoir is closed and pressurized to exclude dirt and dust — includes built-in cartridge type oil filter and a fine mesh strainer.

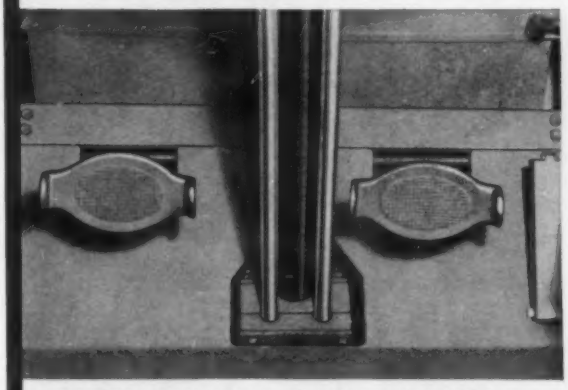
Positive Oil Cooling: Separate fan-cooled oil-to-air radiator assures positive cooling of the transmission and torque-converter oil.

More Accessibility: Compartment on left side with quick-opening cover provides easy access to the battery and all instrument connections. Fuel tank and transmission can be checked and filled from ground level.

Steering-axle Drive Disconnect: A lever in the cab enables the driver to disconnect the rear (steering) axle-drive for over-the-road travel or whenever 4-wheel drive is not needed.

HUSKY BOOM AND POWERFUL BREAKOUT

Boom arms of Man-Ten steel combine exceptional strength with light weight. A single long-stroke hydraulic ram with a high-leverage linkage to the bucket develops powerful bucket break-out action for tough digging assignments.



"OPERATOR'S CHOICE" BRAKE CONTROLS

This exclusive "PAYLOADER" service brake control provides the operator with instant choice of braking with the transmission engaged (left pedal) or disengaged (right pedal) without manual effort.

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125 TONS at 17′ radius
Greatest lift capacity on crawlers

NEW MANITOWOC model 4000 crane

Another first from Manitowoc — the world's only crawler crane with a huge 125 ton lifting capacity! Here's power to make the heaviest lifts with ease — stability to poke booms way up. ■ Look under the powerful new Manitowoc 4000 and you'll find a heavy, massive rotating base with huge hook and house rollers for fast, smooth swings carrying the heaviest loads. The big, stable undercarriage and long, wide-spread crawlers provide a solid lifting foundation. ■ Look *inside* the Model 4000 and you'll find the big, double drum boom hoist that powers loads up *and* down. Boom hoist is self-locking worm gear type that cannot "free wheel". On the rugged main drum the job-proved external brake and internal clutch friction arrangement assure positive control when placing heavy iron sky high. Extra-friction surface, disc-type swingers provide instant response to the operator's touch. Both manual or full air controls are available. ■ To meet any lifting requirement, there is a full range of boom lengths and jibs. The basic boom supplied with the rig is a new Manitowoc "T" section boom 70′ long, available with inserts of 10′, 20′ and 30′. For those really high, lightweight lift jobs, extra long booms and jibs in the 300′ range provide real "sky hook" reach. ■ You'll want more information on the new Model 4000. Get it now from your Manitowoc distributor, or write to the Manitowoc Engineering Corp., Manitowoc, Wisconsin.

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MANITOWOC ENGINEERING CORP.

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CRANES	SHOVELS	DRAGLINES	TRENCH HOES
25 TON - 125 TON	1¼-YD. - 5½-YD.	1¼-YD. - 6-YD.	1¼-YD. - 3-YD.

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Pyke Johnson Heads Research Board

New chairman of the Highway Research Board, which held its 39th annual meeting in Washington in January, is Pyke Johnson, dean of highway leaders in Washington, D. C. Mr. Johnson who succeeds Harmer E. Davis of the Institute of Transportation and Traffic Engineering, University of California, has been a member of the Board's executive committee for over 30 years. He was for many years with the Automobile Manufacturers Association and more recently chairman of the Automotive Safety Foundation which he still serves as consultant.

Mr. Johnson typifies the new Washington leadership in highways which considers in balance the broad and expanding socio-economic problems of road planning and operations as well as materials engineering aspects of highway technology.

W. A. Bugge, director of highways, Washington, and R. R. Bartelsmeyer, chief highway engineer, Illinois, were elected 1st and 2nd vice presidents of the Board.

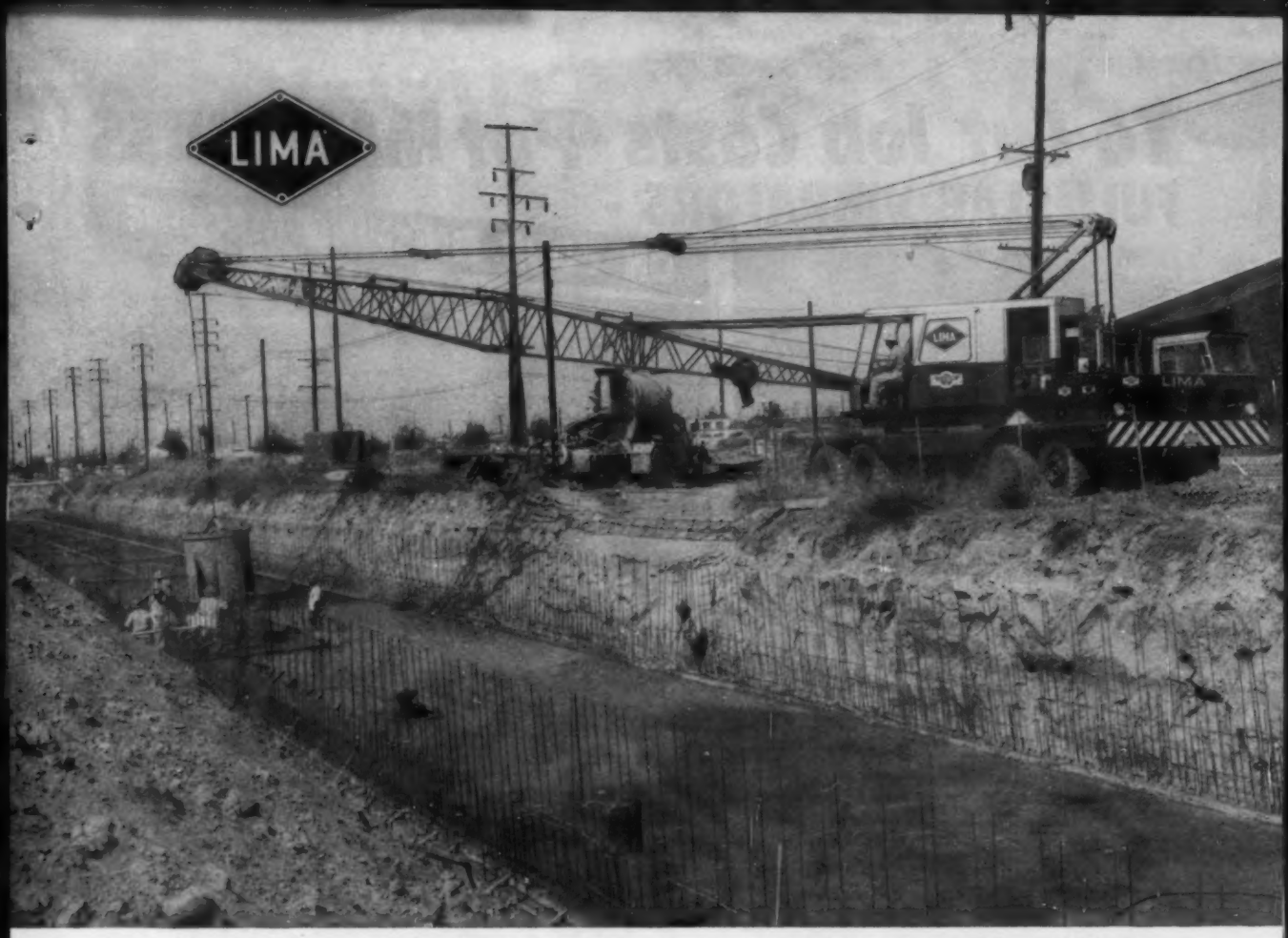
M. G. Spangler and Guilford P. St. Clair receiving the Roy W. Crum Award, with the Board's retiring chairman Harmer E. Davis (right) officiating and H. S. Fairbank, retired deputy commissioner of public roads, assisting.

Honored at the Board's meeting were Merlin G. Spangler, of Iowa State College, and Guilford P. St. Clair, Bureau of Public Roads. They were given the Roy W. Crum Distinguished Service Award for their contribution to highway engineering.

Also honored, for the best paper delivered at the previous annual meeting, were Charles J. Keese, Charles Pinnell and William R. McCasland, all of Texas Transportation Institute, for their research report on freeway operation.

The Highway Research Board's annual meeting in Washington, D. C., drew a record 2,610 attendance. The week-long schedule included scores of committee business meetings, 55 separate public sessions and

Continued on page 36



Lima 64-T daily pours 320 yds. of concrete to speed construction of this Los Angeles County flood control channel.

Has two Limas...buys a third!

"Six years' experience with two 34-T Limas made us decide to buy another Lima when we were in the market for a third truck crane," says master mechanic Rex Williams, of R. A. Wattson Co., N. Hollywood, Calif.

Low maintenance

"We favor Limas for several reasons—easy operating, precision air controls; rapid transportability; low maintenance requirements, and simplified design. I'd say that Limas are top-quality machines, engineered and built for dependable high output!"

The main frame and carrier components of the 64-T are of high-strength, low-weight "T-1" steel. This powerful rig needs no auxiliary aid to lift a 150-ft boom, plus 30-ft. jib, from the ground up. It travels anywhere a truck can go—speeds up to 25 mph.

Pays to buy Lima

There's a Lima type and size for every lifting or digging job! Truck cranes to 75 tons, 140 tons on crawlers; shovels to 8 yds.; draglines variable.

Learn why cost-conscious crane owners and operators agree, "It pays to buy a Lima!"

Ask us for all the facts and figures.

See your nearby Lima distributor. Or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

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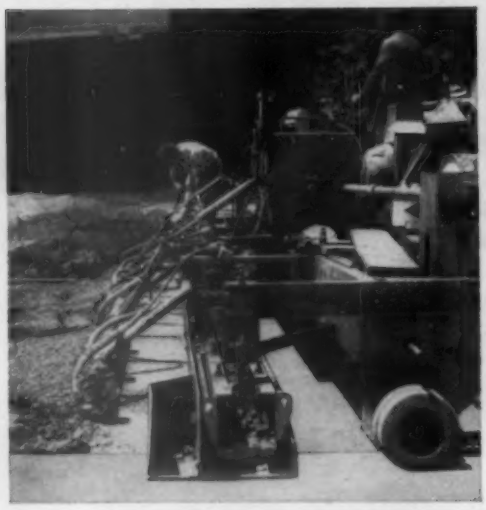
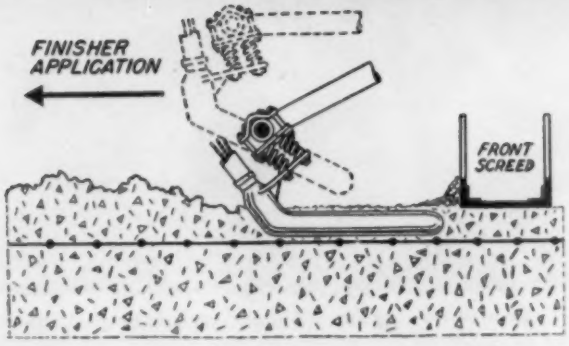
Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing, Screening and Washing Equipment

BALDWIN BLH LIMA-HAMILTON

To Cut Job Costs - Put MAGINNISS FULL SLAB VIBRATORS - ON YOUR FINISHING MACHINE





Increase production 20%

Hundreds of paving contractors are eliminating the second pass of the finisher—and often the need of a spreader—by using MAGINNISS Hi-lectric Vibrators on their finishing machines. Operating completely immersed in the concrete, Hi-lectric vibrators speed distribution, leave surface semi-finished, increase production up to 20%. You can bid lower—and IMPROVE quality of concrete—by using MAGINNISS Hi-lectric internal vibration.

Easy mounting

Quickly mounted on any finisher or spreader. No auxiliary carriage required. All attachment parts are furnished complete.

Minimum labor

The finishing machine operator controls all positioning of vibrator, on and off, and the vibration speed to suit consistency of concrete and other job conditions. Vibrators are raised and lowered by double-acting hydraulic cylinders powered by the hydraulic system of the finishing machine.

Eliminate honeycomb throughout slab

Angle positioning of vibrators below surface of slab obtains most efficient results possible—assures a UNIFORM homogeneous mixture of aggregate and mortar from base to surface. MAGINNISS Hi-lectrics easily handle the stiffest concrete mixes.

Packed with power—built to last

Hi-lectric Vibrators have only TWO moving parts. No brushes, commutators, gears, flexible shafts, nor complicated air or fluid drive mechanisms to require costly repair or replacement. Because the induction motor is located in the vibrator head, it is cooled by the surrounding concrete.

WRITE FOR COMPLETE INFORMATION—or call your nearest MAGINNISS Distributor. He's listed under "Contractors Equipment" in 85 principal cities.

Find your nearest distributor in the "Yellow Pages"

Maginniss HI-LECTRIC VIBRATORS

MAGINNISS Power Tool Company
Dept. RS-30, 154 Disti Avenue, Mansfield, Ohio

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Continued from page 32

Pyke Johnson,
the HRB's new chairman

more than 220 technical and scientific papers.

A substantial part of these papers will be distributed during the ensuing year to Associate and Special Subscription members (the latter a new category). Readers desiring information on membership or published material should address Highway Research Board, 2101 Constitution Avenue, Washington, D. C.

New Publications

CHEMICAL MIXTURES FOR ROAD CLEARANCE: With the increase in average speed, travel, and the annual rise in registration of vehicles, maintenance engineers are obliged to keep highways and streets safe for winter travel despite worst weather conditions. The trend toward the use of chemical mixtures has become increasingly stronger, now adopted by state departments, and county and municipal maintenance organizations. The Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C. has published a booklet entitled "Calcium Choride and Salt Mixtures." The booklet is illustrated and its 24 pages include sections on benefits of using mixtures, when and where to use mixtures, how to use them, and significant results. The recommendations in the booklet are designed to aid engineers considering maintenance procedures which will insure bare pavement. Data and methods presented are those which, through laboratory and field experience, have been found most satisfactory.

HIGHWAY ENGINEERING. By Leon J. Ritter and Radnor J. Paquette. 739 pages, 319 illustrations and tables. Designed as a text for college courses and reference for practical engineers. Price $10. The Ronald Press Company, 15 East 26th Street, New York 10, New York.

Massachusetts Considers $238 Million Bonds

A road bond issue of $238 million is asked by Governor Furcolo of the Massachusetts legislature to finance the state's share of a four-year, billion-dollar state road construction program.

In addition to the bonds the state would issue subsequent grant anticipation bonds to be paid off from later federal-aid grants.


EIMCO

A TRACTOR WITH GUTS AND INTEGRITY! . . .

In any piece of equipment there are vitally important components and engineering developments not apparent to the eye. Only after years of hard and strenuous use, does their strength or weakness become apparent . . . and inscribe itself on your profit and loss statement!

One of the important features of the modern Eimco line of crawler-tractors is the broad use of heat treated alloy steels, for greater strength and resistance to metal fatigue. Instead of using cheaper iron castings, Eimco produces highest quality, carefully controlled steel in its own electric furnaces, under highly skilled metallurgists.

In an Eimco, the track shoes, sprockets, idlers, track rollers and equalizer bars are all produced in Eimco's vast and modern plants from heat-treated cast alloy steels, and other components from special steels, tailor-made by Eimco for their particular end-uses. One of the results has been a record of over seventy per cent savings on maintenance and parts costs by Eimco operators, as against the average for any other leading make of crawler-tractors!

You can easily see many of the Eimco exclusives, such as Up-front Operator Position; "Uni-drive" transmission at work, for flip-of-the-lever shifting, forward or reverse; Dual Final Drives for maximum maneuverability and true spin turns and others.

But remember, under these unique and important features, is the heart . . . the guts . . . of any tractor. The integrity, quality and craftsmanship of the manufacturer. Eimcos are built to a standard that permits a full year guarantee on the entire tractor and transmission.

So step up your work output . . . and profit . . . with the modern and efficient line of crawler-tractors . . .

Eimco 103 100 HP **Eimco 105** 143 HP **Eimco 106** 205 HP

"ADVANCED ENGINEERING AND QUALITY CRAFTSMANSHIP SINCE 1884"

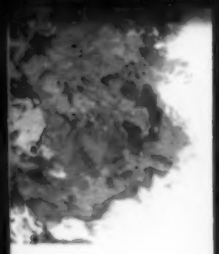
THE EIMCO CORPORATION

EXPORT OFFICE: 51 - 52 SOUTH STREET, NEW YORK, N. Y.
BRANCHES AND DEALERS IN PRINCIPAL CITIES THROUGHOUT THE WORLD

EIMCO

TRACTOR LOADER DIVISION
634 SOUTH 4TH WEST
SALT LAKE CITY, UTAH — U.S.A.

I - 511

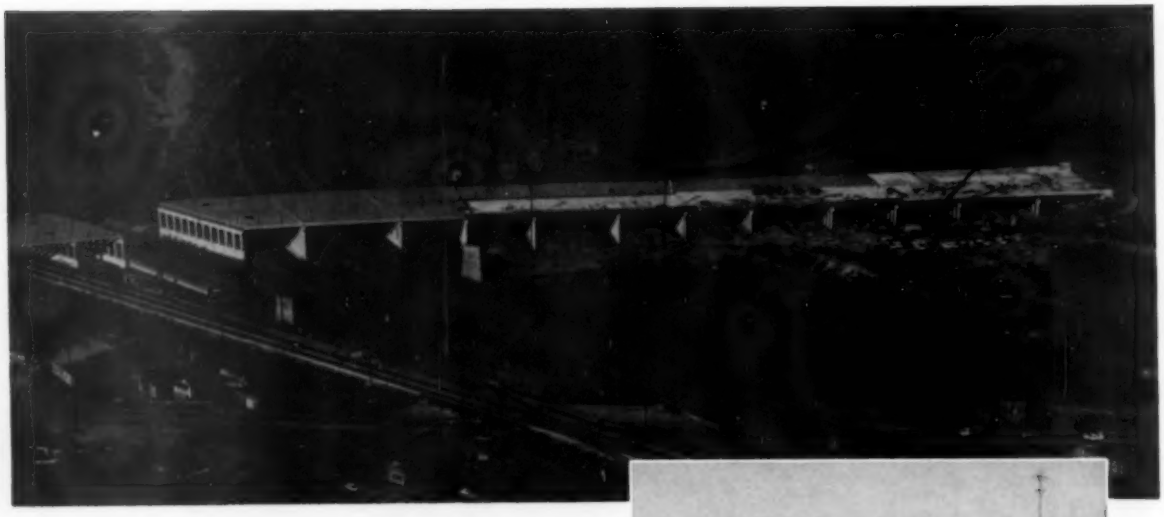


Shown above, is the Eimco 103 Dozer, one of the great machines in this Eimco 100 HP series of crawler-tractors. Available as a basic Tractor, in twelve models of Dozers, as Model 123 Front End Loader and the Eimco 133 Special Steel Mill FEL and the 143 Log Loader.

Eimcos can take it! Every major steel mill has found that Eimco Loaders, such as the Eimco 115 Excavator shown here, will outproduce, outload and outlast any other loader . . . will keep producing and performing, with minimum maintenance, year after year. The famous 105 series is powered by 143 HP GMC Detroit Diesel or 130 H.P. Cummins Diesel engine of latest, modern design. Available as Tractor, Dozers, Excavators, Special Mill Excavators and Front End Loaders.

Get all the facts! Contact the Eimco Dealer or Branch nearest you, or write The Eimco Corporation, P. O. Box 300, Salt Lake City 10, Utah, U.S.A.

Powered by the newest V-6 diesel engine, the 106 series features the most practical Front End Loader and Log Loader offered today. Combining maneuverability and speed with the power of 205 HP, the Eimco 106 series is available as a Tractor, all types of Bulldozers, Front End Loader (Model 126), Special Steel Mill FEL (Model 136) and, as pictured, Model 146 Log Loader with all Forestry Department approved attachments.



LACLEDE REINFORCING STEELS strengthen new Illinois interstate system

This section of the new East St. Louis Expressway will soon become a part of the Interstate and Defense Highway U. S. Route 70 and 44. Approximately 1100 tons of Laclede reinforcing bars were furnished for this project, which spans the major main-line railroad tracks connecting St. Louis and the East.

Put the complete line of Laclede reinforcing steels and services to work on *your* next job.

CONTRACTORS
H. H. Hall Construction Company, East Saint Louis, Illinois
Fruin-Colnon Contracting Company, Saint Louis, Missouri

LACLEDE

LACLEDE STEEL COMPANY

SAINT LOUIS, MISSOURI ◆ Producers of Steel for Industry and Construction

. . . for more details circle 336 on enclosed return postal card

Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS—Spring Meeting, New Orleans, La.; March 7-11.

WISCONSIN ROAD BUILDERS ASSOCIATION—Annual Meeting and Convention, Schroeder Hotel, Milwaukee, Wis., March 14-16.

AMERICAN CONCRETE INSTITUTE—56th Annual Meeting, Commodore Hotel, New York City; March 14-17.

MISSISSIPPI VALLEY CONFERENCE OF STATE HIGHWAY DEPARTMENTS—Edgewater Beach Hotel, Chicago; March 16-17.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA—41st Annual Convention, Masonic Memorial Temple, Fairmont, Mark Hopkins and supporting hotels, San Francisco, Calif.; March 21-24.

NORTH ATLANTIC STATES HIGHWAY OFFICIALS—Annual Meeting, Bellevue Stratford Hotel, Philadelphia, Pa.; March 29-April 1.

OHIO HIGHWAY ENGINEERING CONFERENCE, Ohio State University Union, Columbus; April 5-7.

NEW YORK STATE ASSOCIATION OF HIGHWAY ENGINEERS—21st Annual Convention, Hotel Syracuse, New York; April 6-8

FORTY-SIXTH ANNUAL PURDUE ROAD SCHOOL, Purdue University, Lafayette, Ind.; April 18-21.

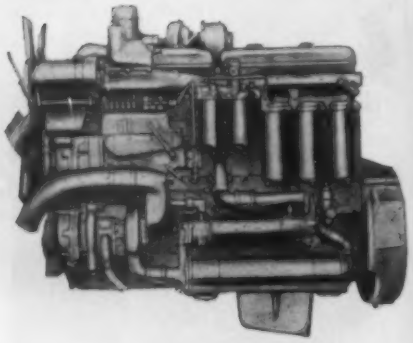
MARYLAND HIGHWAY CONTRACTORS ASSOCIATION—Spring Meeting, Baltimore, Md., April 21.

AMERICAN WELDING SOCIETY—41st Annual Convention and Exposition, Biltmore Hotel and Great Western Exhibit Center, Los Angeles, California; April 26-28.

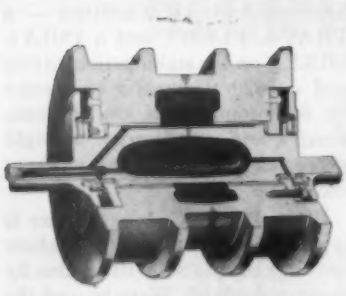
EIGHTH HIGHWAY TRANSPORTATION CONGRESS—National Highway User's Conference, Washington, D. C.; May 10-12.

CONCRETE PAVING AWARDS announced by the Portland Cement Association for calender 1959 include 49.3 million sq. yd. of road paving, 34.9 million sq. yd. of streets and alleys, and 9.1 million sq. yd. of airport work—93.4 million sq. yd. in all.

Three new International TD-25's of contractor V. E. Posey's fleet team up preparing home sites from a mountainside...near San Diego, California. One "25" operator comments: "The power is there, but big engine 'sound and fury' are just about gone!"



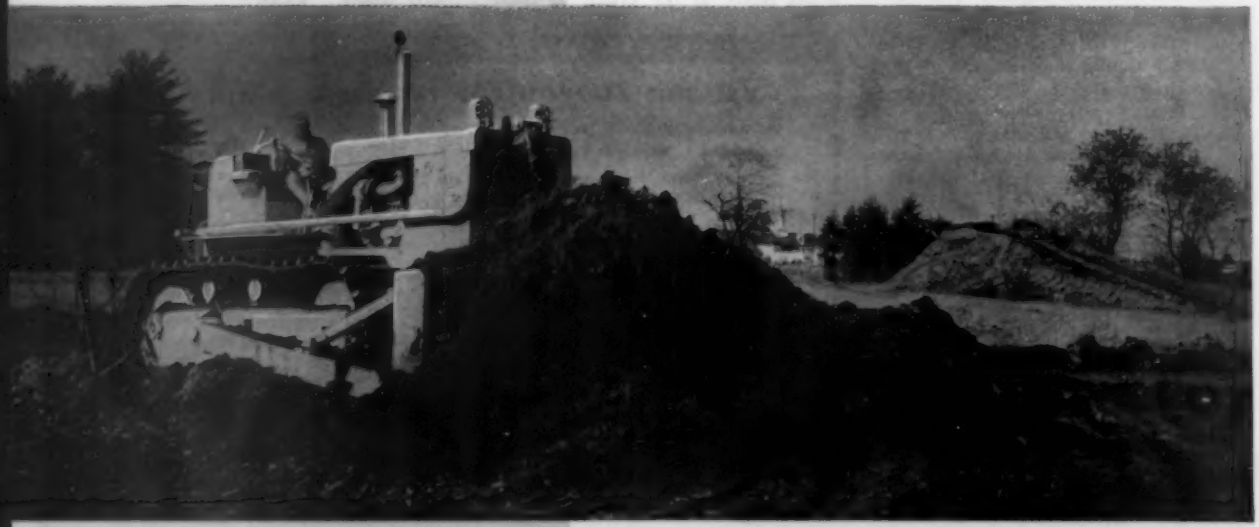
Big power "plus" of the new TD-25 is the new direct-start, 6-cylinder turbocharged International DT-817 diesel engine. Tri-metal crankshaft bearings; valve rotators; dry-type air cleaner; externally-mounted, gear-driven oil and water pumps—all are typical DT-817 long-life, high-output features!



How you get full-

Thick-shelled International Dura-Rollers have king-sized lube reservoirs, positive sealing, and exclusive relief-passage protection from over-lubrication. These *minimum maintenance* track rollers give you practical 1,000-hour lubrication intervals!

Keep full loads on the move full time with exclusive Planet Power-steering. Full power on both tracks, full time, is the answer! And Hi-Lo on-the-go power-shifting lets you match power to condition, instantly, to keep loads "on the move"—and increase speed where practical! This "25" belongs to Berke Moore Co., Inc., Boston expressway contractor!



load turns...full-speed cycles

with proved TD-25 standard equipment!

As standard equipment at no extra cost, the new 230-hp TD-25 gives you the International® proved control combination that has been outproducing king-sized clutch-steered crawlers for years!

You get combined Planet Power-steering and Hi-Lo on-the-go, power-shifting exclusively in the new International TD-25. And you get this basic, built-in design advantage in your choice of torque-converter or synchromesh model!

With this and all its other big advantages, the TD-25 can outearn other big rigs up to 50%—on push-loading, bulldozing, or pulling big drawbar tools such as a shale-shattering ripper!

No "dead-track drag" or "gear-shift lag"!

Planet Power-steering gives you full-time "live" power and traction on both tracks, to make full-load turns—and to eliminate load-limiting "dead-track drag." And Hi-Lo on-the-go power-shifting instantly matches power to conditions to end load-losing "gear-shift lag."

Hi-Lo power-shifting makes the TD-25 the industry's only king-sized 4-speed torque-converter crawler, and the only one with load-matching efficiency-range control. In the synchromesh transmission "25," the Hi-Lo planetary system gives eight speeds forward and reverse. Either model gives you cycle-speeding, up-or-down, on-the-go power-shifting with "finger-tip" ease!

Power-shift and power-steer the new "25" with king-size loads—around curves, upgrade, anywhere. Prove what it means to command full-time, full-load ability to outearn clutch-steered king-sized crawlers, up to 50%—and with standard control equipment! Compare simplified TD-25 design—the only planetary system engineered and located to give you "live track" power steering and on-the-go, up-or-down power shifting! See your International Construction Equipment Distributor for a demonstration!

. . . for more details circle 326 on enclosed return postal card

International® *Construction Equipment*

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Illinois
A COMPLETE POWER PACKAGE

OKLAHOMA PROJECT I-205 (5) Interstate Route 40

Oklahoma builds to last...with "DEEP-STRENGTH" Asphalt pavement

• Hot-mixed—hot-laid Asphalt base promises outstanding service life.
• Design overcomes problems of plastic subsoil and short aggregate supply.

Down in Oklahoma, they've just completed a beauty . . . a new *Deep-Strength* Asphalt pavement that includes many features of The Asphalt Institute's Advanced Design Criteria.

And it won't be the last. That's for sure.

Just take a look at the construction (right) and cross section (below). Notice that precepts of new *Deep-Strength* Asphalt design are incorporated...heavy-duty Asphalt concrete surface course . . . heavy-duty Asphalt base . . . Asphalt primed subbase . . . wide double-sealed Asphalt shoulders (on Asphalt base) . . . heavy compaction . . . good drainage.

When designed like this — for *Deep-Strength* . . . Asphalt pavements will carry the heaviest traffic loads without distress . . . with minimum maintenance cost. Witness the New Jersey Turnpike. Witness also *Deep-Strength* Asphalt city pavements built more than 60 years ago and still in service.

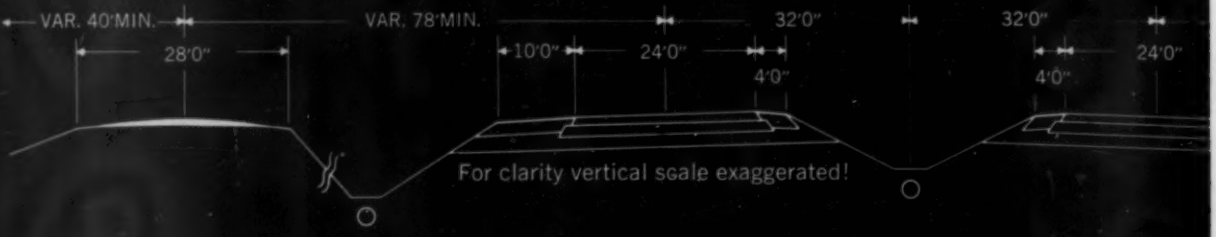
Save money, too

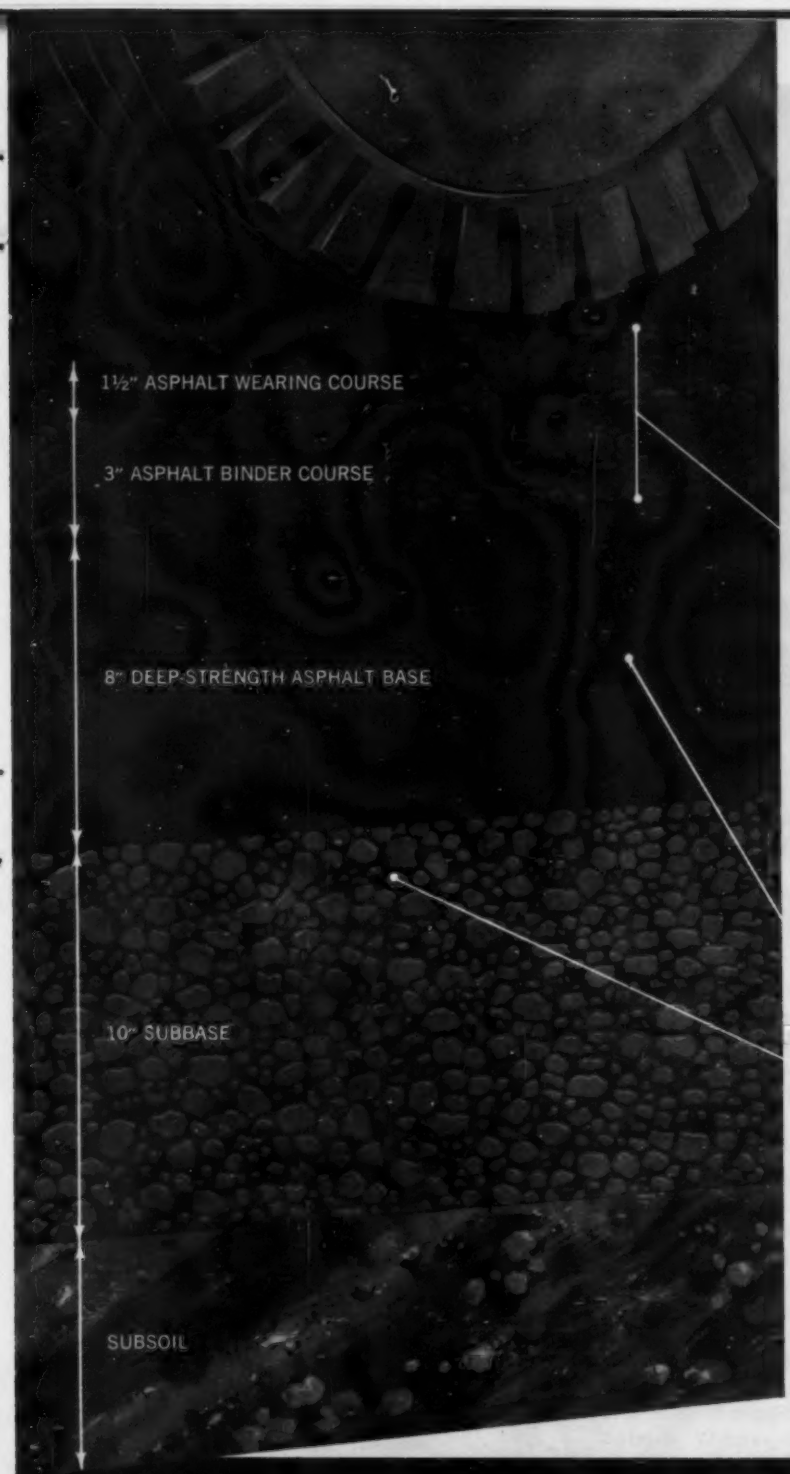
Surprising as it seems at first glance, modern low-maintenance, *Deep-Strength* Asphalt pavements often cost less to build than Asphalt pavements designed to other standards. That's because the Advanced Design Criteria permit inexpensive Asphalt base to be substituted, within limits, for the more expensive Asphalt concrete surfacing. And also because total pavement thickness can often be reduced by several inches.

New Handbook

Now on the presses is a new edition of The Asphalt Handbook. It incorporates all the Advanced Design Criteria for highways implied by the term *Deep-Strength* Asphalt Construction. Copies soon will be available at The Asphalt Institute office serving your area.

DEPRESSED MEDIANS ASSIST FREE DRAINING. Note also the Asphalt shoulder construction. These two measures alone can substantially



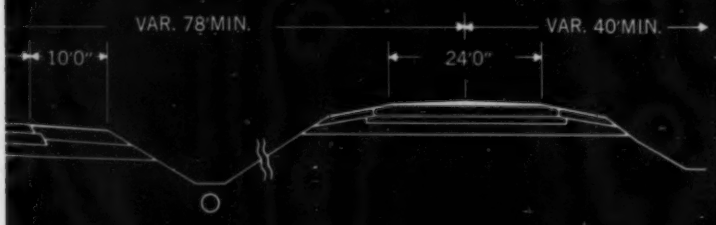


4½-INCH ASPHALT CONCRETE SURFACE takes heaviest traffic, deicing salts without distress. Lane markings show up better day or night, wet or dry.

8-inch sand-Asphalt base provides deep strength . . . excludes moisture, insures smoother riding surface under heaviest traffic.

ASPHALT PRIME COAT SEALS SUBBASE . . . insures bond with overlying Asphalt base.

lengthen pavement life.



Ribbons of velvet smoothness . . . ASPHALT-paved Interstate Highways.

DEEP-STRENGTH

THE ASPHALT INSTITUTE

Asphalt Institute Building, College Park, Maryland

Here, PSR-9 compacts gravel road in Jefferson County, Wisconsin. Kneading action of pneumatic tires, plus oscillating action on all 9 wheels, helps the PSR-9 key and lock loose materials in place. Helps eliminate hairline tracks when rolling asphalt, too.

LOWER YOUR OPERATING COSTS with the VERSATILE PSR-9

Handles both big and odd-lot jobs profitably . . . meets specs fast on breakdown, intermediate, or finish rolling.

You're looking at the world's most modern pneumatic roller — introduced last year and designed *from the ground up* to answer your needs for more efficient rolling. The PSR-9 gives you 3 to 10 tons of compaction weight on 9 wheels. All wheels oscillate for contour compaction. There's one-half inch overlap between front and rear tires . . . over-all rolling width, 5'8" per pass.

Sliding gear transmission with torque converter gives operator smooth, infinite speed selection over 3 speed ranges, at up to 15 mph in both directions. Direction of travel and speed are both controlled by single combination lever for easier and more accurate shuttle rolling and control.

Other operator controls include power steering, and power brakes. Low center of gravity, mechanical parking brake, and short 18'10" outside turn radius are other features your operators will like. Why not get the most quality your dollar will buy in your next pneumatic tire roller? See the PSR-9, or bigger 10 to 30-ton companion model PSR-30 . . . today.

New forward-reverse throttle (arrow) gives operator instant one-lever control of direction and speed. Push forward for forward travel, pull back for reverse...that's all there's to it!

"Big brother" to the PSR-9, 7-wheel PSR-30 offers 10-30 ton compaction weight . . . speeds to 19.4 mph forward and reverse. Note how dual controls, plus special frame contour, give operator clear view of both guide and drive wheels on either side.

Tell me more about the ☐ PSR-9 ☐ PSR-30

NAME

COMPANY TITLE

ADDRESS

CITY, STATE

RS-82

BUFFALO-SPRINGFIELD COMPANY SPRINGFIELD, OHIO
A Division of Koehring Co.

BUFFALO-SPRINGFIELD COMPACTION EQUIPMENT • FLAHERTY SPREADERS AND SWEEPERS • STARDRILL-KEYSTONE DRILLING MACHINES

. . . for more details circle 333 on enclosed return postal card

New Koehring 330 "SPRAWLER"

Good news travels fast! Gentry & Thompson Contractors, of Atlanta, already have the first 330 "SPRAWLER". It's shown here driving reinforced concrete piles on Interstate Highway I-75, near Cordele, Georgia. A short time later, another alert Georgia firm, E. R. Snell Contractors, also bought one and the machine was recently delivered.

outlifts its own weight by 11%

Max. lift capacity	**60,000 lbs.** (30′ boom @ 12′ radius)
Working weight	**54,000 lbs.***
Counterweight	power-removed (by A-frame)
Sprawling outriggers	pivot-mounted removable pedestals
Boom lengths	30 to 120 feet (pin-pad connected)
Jibs (on max. boom)	15 to 30 feet

*APPROX.

Pivoting outriggers swing out IN A MATTER OF MINUTES!

You're always ready to lift, *ready to go* with new Koehring® 330 "SPRAWLER" crane! Only takes a few minutes to sprawl the pivoting outriggers into position. Attach aluminum pedestals, and make your lift — up to 60,000 pounds! Want to lift and carry? Just raise the pedestals for ground clearance, and the 330 "walks" with 47,980-pound load. Or — remove the pedestals, swing outriggers against crawlers, and you're on your way! A phone call to Koehring distributor brings you the full story. Call or write today.

Yes, tell me more about 30-ton 330 "SPRAWLER" crane

☐ Also send specs. on larger 45-ton cap. 545 "SPRAWLER"

Mail to: KOEHRING DIVISION, 3026 W. Concordia, Milwaukee 16, Wis.

NAME _____ TITLE _____

COMPANY _____ DEPT. _____

STREET _____

CITY _____ STATE _____

..keep your eye on KOEHRING WORK CAPACITY

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4½ CU. YD. BATCH (10% overload)	2½-MIN. MIX TIME	2-MIN. MIX TIME
Cycle time	90 sec.	75 sec.
No. batches per hour	40	48
Cu. Yds. per hour	180	216

Puts batching, mixing on continuous production-line basis—

Secret of high output in the Johnson TWIN-MIX plant is continuous split-second weighing, batching, mixing. Twin 112-S tilting mixers, air-ram controlled, interlocked, discharge only when pre-set mixing cycle is complete. Truck driver triggers the discharge switch. Fast, efficient on central-mix paving, or any mass-concrete jobs.

Weighs cement separately—meets rigid concrete specs.—

Overhead storage bin is divided into 4 aggregate compartments, each holding 28½ cu. yds. (43 tons @ 3,000 lbs. per cu. yd.). Central cement compartment has 125 to 150-bbl. (600 cu. ft.) capacity. All materials weigh out automatically through Johnson® Concentric batcher with individual scale for separate weighing of cement.

60 pre-set mixes—continuous graphic recording—

At the turn of a dial, operator selects any one of 60 different mixes. All aggregates, cement, water are dial-controlled. Graphic recorder accurately registers weight of each material, with time, date, batch serial number, and mix identity all on same chart!

Portable-section design—easy stack-up assembly—

For all its size, capacity, TWIN-MIX plant comes in easily-shipped units: 2-section bin; pre-assembled mixer section; complete-package batcher section—all with pre-fit couplings, quick plug-in connections. No unit over 11 ft. wide, 12 ft. high.

Be ready to bid and take more concrete jobs this year, earn more profit per job — get all the facts on this high-production TWIN-MIX plant without delay. Your Johnson distributor is the man to see. Call him today, or send coupon for facts-by-mail.

more IDEAS for you:

Electronic Batch Controls

for automatic batching of pre-set mixes are graphically described in new technical 8-page bulletin. Special section devoted to packaged circuits, ad-mix batching, graphic recording.

"Automate" Cement Batchers

New Johnson dial-head control system fits any make of cement batcher, quickly installed in just a few hours time. Read all about it in new illustrated spec. sheet — yours for the asking!

Heavy Construction Mixers

Interested in big volume production of central-mix concrete? Fact-packed mixer bulletin will give you a profitable idea or two — plus quick reference data on Koehring-Johnson line.

Electro-Mechanical Systems

for concrete plant operation, automatic batch controllers and recorders, 60 and 120 mix selectors, etc., are featured in this 6-page bulletin — worth adding to your reference files!

Send for your FREE copies

To: C. S. JOHNSON COMPANY, Champaign, Ill.

Mail us literature on:

- ☐ Automatic dial-head
- ☐ Twin-mix paving plant
- ☐ Heavy construction mixers
- ☐ Electronic batch controls
- ☐ Electro-mechanical systems

NAME

TITLE

COMPANY

DEPT.

STREET

CITY, STATE

RS-J9

• • • CHAMPAIGN, ILL. • STOCKTON, CALIF. A Division of Koehring Company

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New Prestressed Concrete Institute Headquarters

The Prestressed Concrete Institute has established new headquarters at 205 West Wacker Drive, Chicago, Ill., it was announced by Randall M. Dubois, newly elected PCI president.

The move from Boca Raton, Fla., was planned for greater centralization of activity and dissemination of information to this "over $300,000,000" industry, Mr. Dubois, explained. "This move," he stated, "brings us in closer touch with our growing membership (now over 500)."

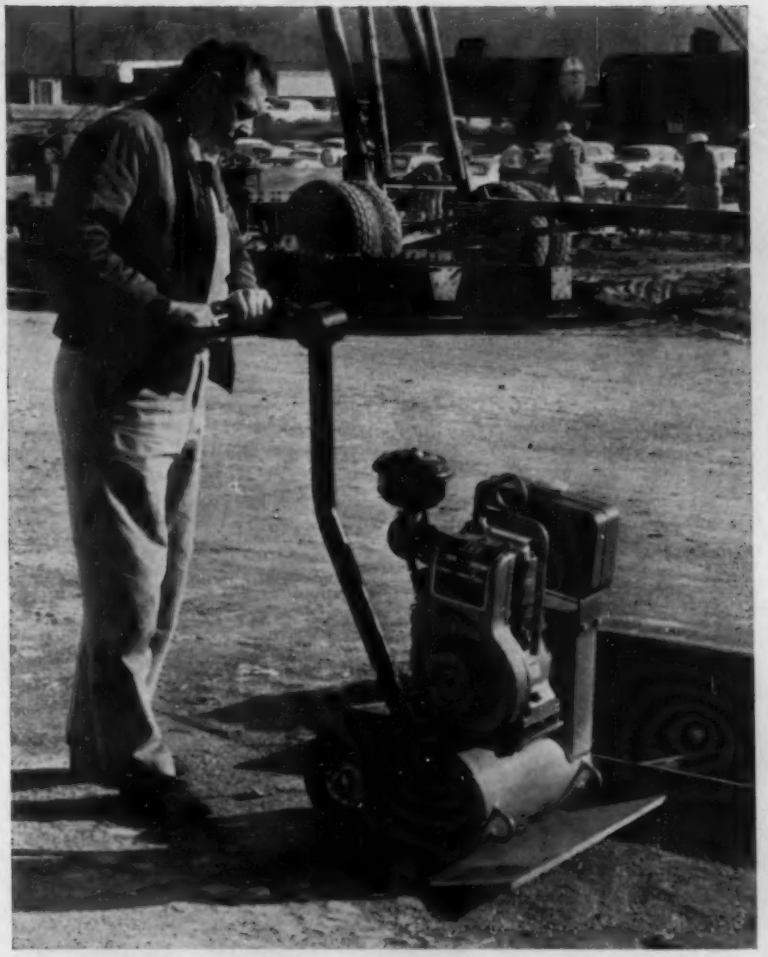
The new headquarters will maintain a library for the use of members, engineers, construction experts, architects, trade editors and students. It will also serve as liaison for the exchange of information, research data and new methods between members.

The move to Chicago also marks the launching of an expanded public and industry information program on use of prestressed concrete.

President Dubois who heads Freyssinet Company, Inc., N. Y., is part of an officer slate which includes as vice president, Jacob O. Whitlock, Mid-West Prestressed Concrete Co., Springfield, Ill., and secretary-treasurer Charles L. Scott, Jr., Southern Prestressed Concrete Co., Inc., Pensacola, Fla.

The Prestressed Concrete Institute is an incorporated, non-profit association of producers of precast and prestressed concrete products and related materials and equipment, and members of the architectural and engineering profession. The Institute's charter calls for the establishment of industry-wide standards of production, quality-control and uniformity as well as the advancement of prestressed concrete acceptance through research grants to investigate new applications and engineering concepts.

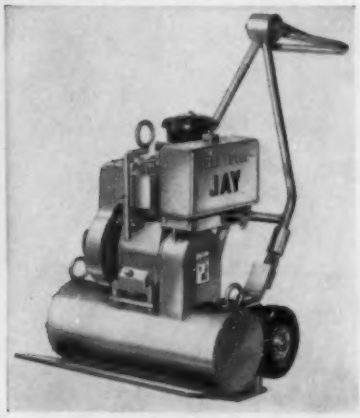
To coordinate and expedite the establishment of the industry standards and research grants, the PCI has established a special Technical Activities Committee under the chairmanship of Charles C. Zollman of Newton Square, Pa.



MODEL J-18 IS THE ALL-AROUND TAMPER. It fits the widest range of jobs, areas, soils; has interchangeable tamping plates in 18", 24" and 30" widths.

MODEL J-13 IS THE SMALL AREA TAMPER. Ideal for soil under footings, in narrow ditches and for bituminous concrete compaction, using special water plate available as J-13 accessory. Has interchangeable soil tamping plates in 13", 18" and 24" widths.

MODEL J-36 IS THE BIG AREA TAMPER. For maximum production; has interchangeable tamping plates in 24", 30" and 36" widths.



3 great new Jay Tampers speed compaction 6 ways

Jay now gives you unequalled performance on all types of compaction where big equipment is uneconomic:

1. TAMP HARDER:
Tamping force increased up to 50%.

2. TAMP FASTER:
Travel speed increased up to 100%.

3. TAMP BETTER IN HEAVY SOILS
because of improved plate contour.

4. HANDLE EASIER:
New tubular-loop handle provides better grip, turns machine in shorter radius, dissipates vibration more effectively through new rubber shock-mount and steel cable connection.

5. MAINTAIN EASIER:
Mechanical improvements include larger oil-bath air cleaner and new air cleaner mounting of solid cast aluminum, bolted rather than clamped.

6. TRANSPORT EASIER:
New Jay Trailer can be loaded, unloaded by one man; carries any one of the 3 tampers.

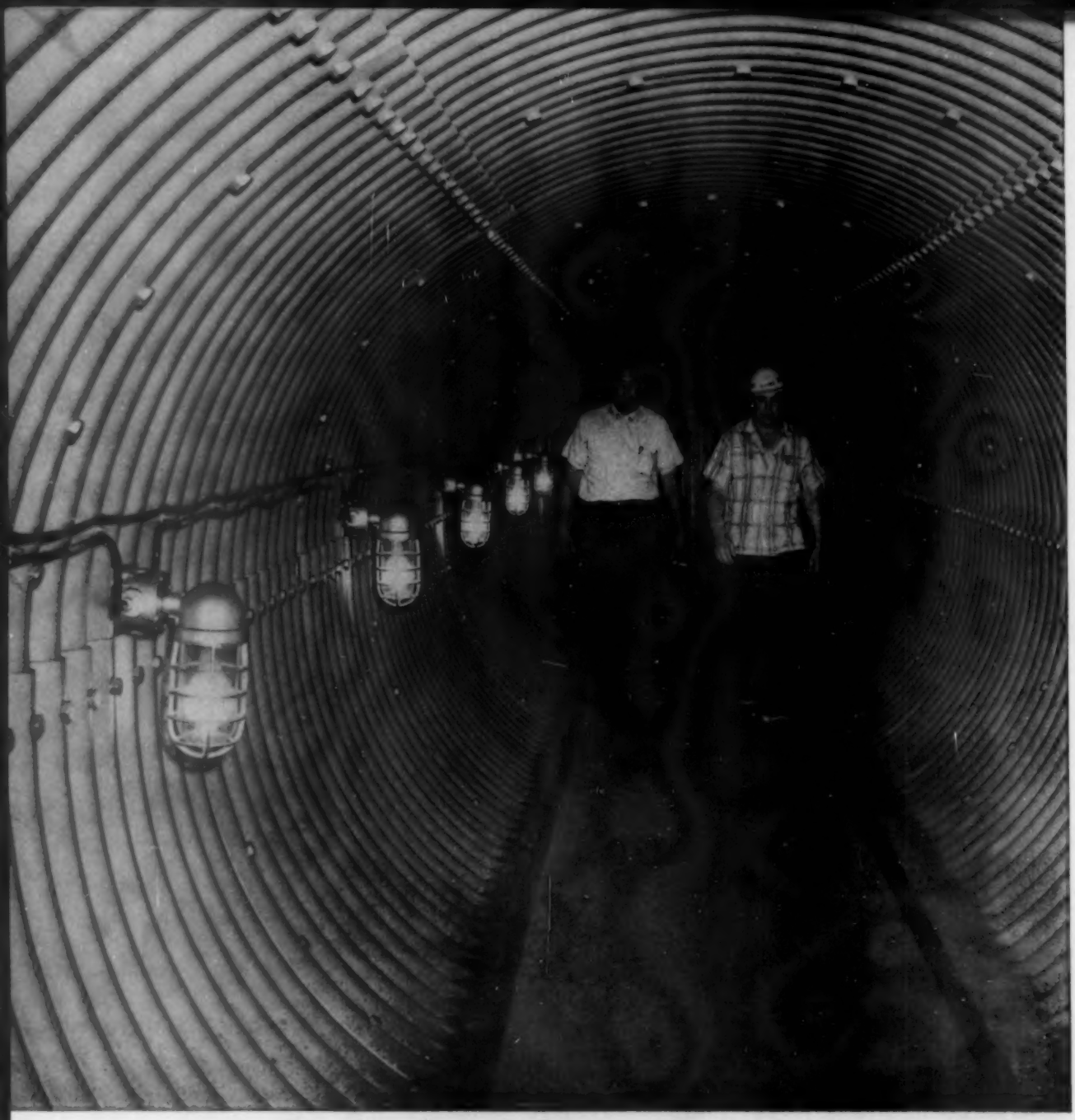
"CUTS COSTS FROM $2.68 TO 12¢"
These improvements keep Jay years ahead of other tamping machines or methods, add to its already surprising ability to cut costs on all kinds of compaction jobs. One user tested a Jay vs. a 5-man pneumatic tamper crew and reports: "Compaction costs cut from $2.68 to 12¢ per cubic yard." Another reports that Jay cut his compaction costs 89% on one phase of the U. S. Air Force Academy construction project.

Jay is the original one-man, self-contained, self-propelled vibratory compactor . . . the *only* one offering a full range of 3 models and interchangeable tamping plates to fit all jobs. All models are powered with 4-cycle Wisconsin Model BKN engine of 6.8 H. P. at 3600 RPM, or equivalent.

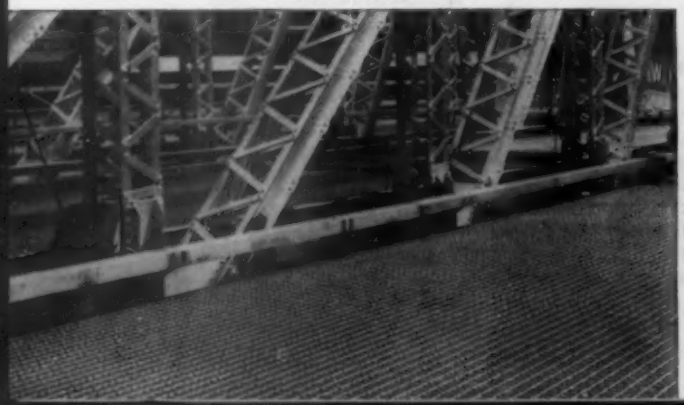
Send today for new Catalog J-0 giving full details and specifications, and for name of your nearest Jay dealer. Jay Division, J. Leukart Machine Co., Inc., 2228 South Third Street, Columbus 7, Ohio.

JAY tampers

. . . for more details circle 335 on enclosed return postal card



USS AmBridge I-Beam-Lok is a sturdy, lightweight bridge flooring. It installs quickly and easily with few interruptions. The filled type is available in units 6′ wide and up to 49′ long that apply directly to stringers on spans from 6′ up to 8′ centers. The open type is also available for spans up to 4′ long.



USS AmBridge Highway Beam Guardrail and Posts help safeguard traffic. This rugged, flexible steel beam guardrail is highly visible. It bolts easily but firmly to steel posts and is available in 25′ lengths to minimize splicing.

This is a people pipe

This passenger underpass was fabricated from USS AmBridge Sectional Plate—normally used for drainage structures. It's buried 10-feet below the railroad tracks at the Philadelphia Electric Company's Eddystone Station near Philadelphia, Pennsylvania. □ USS AmBridge Sectional Plate was an ideal choice for this underground passageway, because it won't crack. Won't break. It's a permanent steel structure. It was easy to erect . . . there was no need for forms. AmBridge Sectional Plate comes in a complete range of sizes. And, it's fabricated to meet all federal and state specifications. Write or contact any one of our offices for literature and information on American Bridge Highway Products.

USS and I-Beam-Lok are registered trademarks

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American Bridge Division of United States Steel

USS

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Letters

To the Editor:

Your editorial on the new contractor-engineer relationship in the January issue of Roads and Streets was read with a great deal of interest and approval.

It is my opinion that Texas has taken a step in the right direction when the AGC in its ten different areas organized and began holding joint engineer-contractor's meetings throughout the State of Texas. I am not sure just when these meetings started, but I think it was sometime in 1957. Not knowing whether you know just what was done, I will briefly give you the general pattern of the meetings.

All contractors in a highway district area would meet with all engineering personnel of the district for an hour of fellowship and visiting. After the social period, the complaints or I prefer calling them suggestions, of the engineering personnel were listed and given to the contractors. The contractors in turn listed their suggestions of things that they would like to see done by the engineering personnel of the district. No names were called, no construction contractors names mentioned, just a general listing of those things that each side considered would be desirable to improve their operations. I know of no other thing that has done more to improve our contractor-engineer relationship than this one item, and I think Texas AGC should be commended for their work on this.

It was my pleasure to attend the WASHO meeting in Utah in 1958 and insofar as I could determine Texas was among the first, if not the first, in starting this type of joint meeting. All of those I talked to at that WASHO meeting agreed it was an excellent way of improving our relationship. Certainly both of us (engineer and contractor) want to give the taxpayer the full value of his dollar, and we certainly cannot do this if we are not working together in the over-all picture. As I told James M. Richards, Secretary-Manager of the Texas AGC, the public will hang us separately if we don't do our job correctly, so certainly it is to our advantage to hang together and work together in this tremendous job that we have ahead of us.

Additional articles, as you mentioned in the editorial, will be looked for with a great deal of interest in the future.

O. L. Crain
District Engineer,
District 5, Texas Highway,
Department, Lubbock

Brinson-Allen's No. 14 is equipped with Preco Automatic Blade Control. This exclusive factory-installed attachment for all Caterpillar Motor Graders saves money on a wide range of applications. With the desired slope set on the dial, the operator only has to control depth of cut. The transistorized unit automatically maintains blade slope within ⅛ inch in ten feet.

CAT NO. 14 MOTOR GRADER INCREASES PRODUCTION 20 PER CENT

This Cat No. 14 Motor Grader handles subgrade and base on the western approach of the Interstate System highway bridge between Tampa and St. Petersburg, Fla. Charlie Clyatt, superintendent on the job for owner Brinson-Allen of Tampa, reports, "We have increased production about 20 per cent. The No. 14 has more weight, traction and power, gets the job done quicker. It has never failed to stay well ahead of the base crew."

Here's why the big No. 14 excels in weight, power and traction: It weighs a hefty 29,280 lb. . . . the 150 HP turbocharged engine delivers power to spare . . . 14:00-24 tubeless tires all around provide excellent stability. The 12 ft. (standard) or 14 ft. (optional) moldboards with ample throat clearance between moldboard and circle assure you of greater loads than ever before.

But this versatile motor grader has more than sheer power and weight. Features like the dry-type air cleaner which removes 99.8 per cent of the dirt from intake air means longer service life. The exclusive Caterpillar oil clutch, which operates up to 2000 hours without adjustment, practically eliminates down time for clutch repair. Operator has excellent visibility to front wheels, toe of blade and circle. The power steering and power brakes are designed for operator efficiency and high productivity. These are just a few of the reasons why the No. 14 is the most profitable and productive motor grader in its class.

Heavy-duty circle and moldboard on the No. 14 provide big load carrying capacity. Circle and moldboard are strong to match engine power and can absorb the punishment of rough work. Mechanical blade controls provide precise, fast blade adjustment and positive hold.

See your Caterpillar Dealer and ask him to demonstrate the No. 14 on the toughest application *you* can find. See for yourself how the rugged No. 14 can handle the hard work.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

CATERPILLAR

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STEP UP PRODUCTION WITH THE NEW NO. 14

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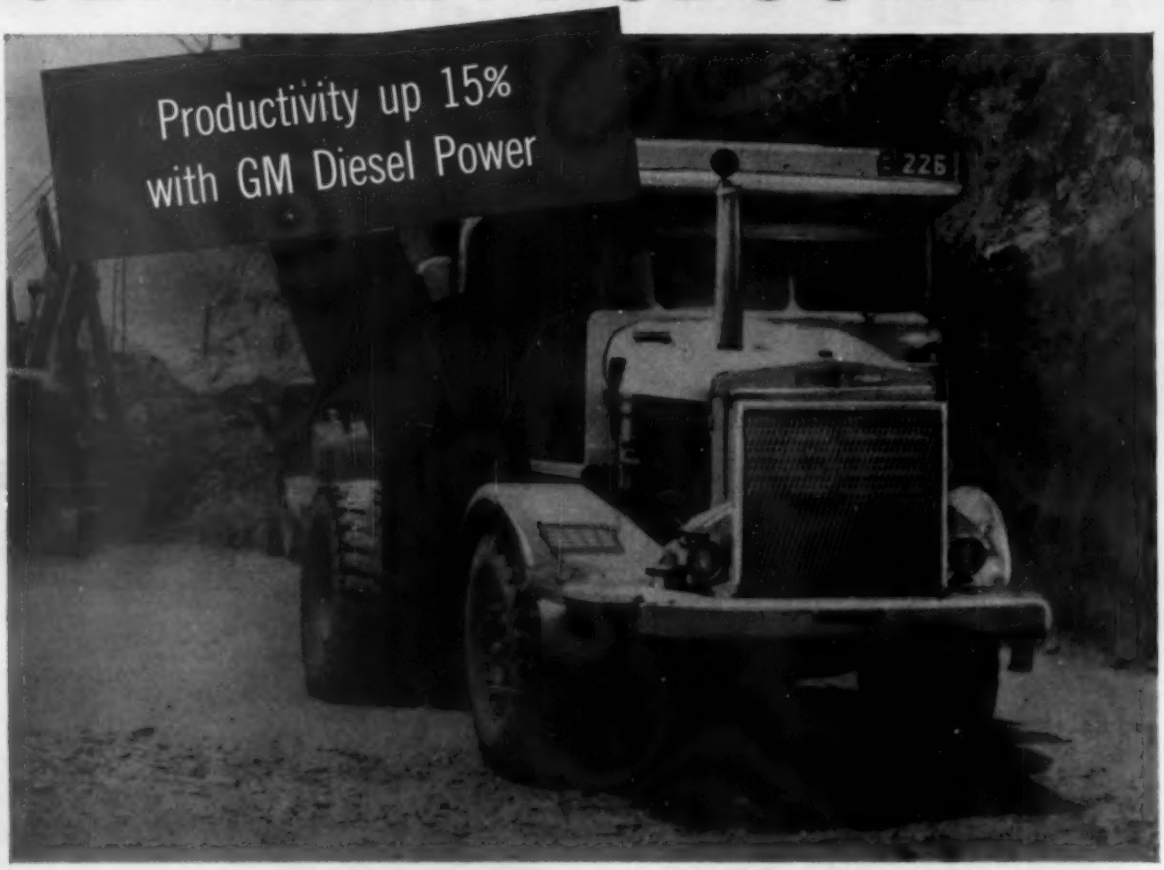
GET REAL PRODUCTIVITY



Imagine what your profits would be if you could cut down the size of your equipment fleet without losing any production. Or if you got more work done with the construction equipment you have now.

Gull-Defelice—contractors handling a major part of the Niagara Power Project—don't have to imagine, they know.

They put 6 GM Diesel-powered Euclid 27-ton rear-dumps to work side by side with 6 more "Eucs" powered with other Diesels—kept a sharp eye on productivity per unit.

Result? The GM Diesel-powered trucks hauled an average of 78.68 tons per hour compared with 68.12 tons for the other rear-dumps. On an 8-hour shift, that adds up to 84.48 *more* tons hauled.

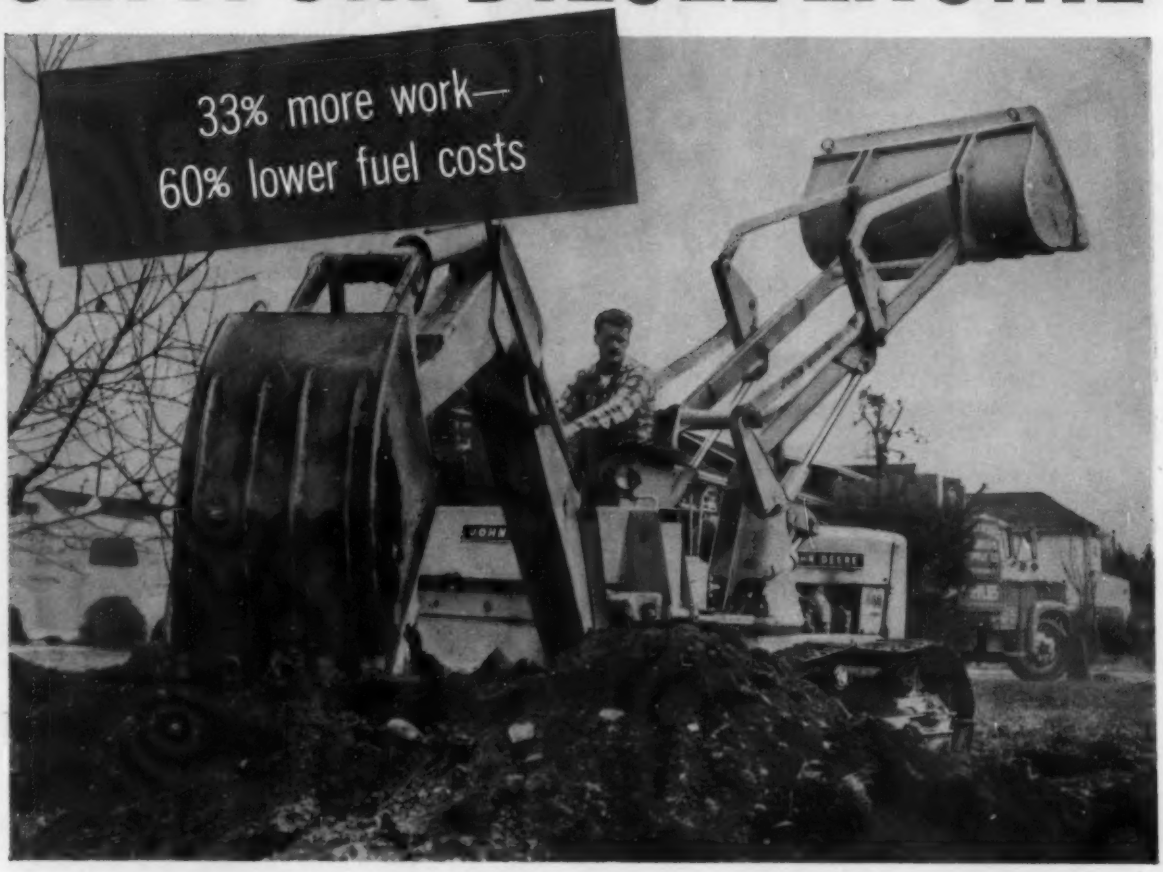
What's more, Gull-Defelice found it cost 25.4% *less* to operate the "Jimmy" powered units on a ton-hour basis.

You, too, can boost your productivity—realize more profit from your equipment investment—with GM Diesel power. And on some jobs, the bonus productivity of General Motors Diesel-powered equipment could well save you the cost of an additional scraper or dump truck.

Before you figure your costs on your next bid, find out the savings you can make with GM Diesel power. See your GM Diesel distributor for full information or mail the attached postcard today.

GM DIESEL ALL-PURPOSE

GET A GM DIESEL ENGINE



Load a 5-yard dump truck with a ⅞-yard front-end loader in two minutes and you're really moving dirt.

And that's exactly what Robert Kruger of Emerson, N. J., is doing with his General Motors Diesel-powered John Deere 440 ICD.

He replaced a gasoline-powered unit with this tractor, says his new rig "works ½ faster—cuts fuel bills 67% —delivers lots more power."

And he'll also tell you his GM Diesel-powered machine outworks other Diesel tractors with higher ratings.

And why does the 440 work so fast? Listen to Mr. Kruger: "It's the 'Jimmy's' quick response to the throttle—that engine sure revs up fast."

Mr. Kruger is earning more—saving more—because of the extra productivity he's getting since he switched to a General Motors Diesel-powered machine. You could be doing what he's doing if you had a "Jimmy" Diesel in your equipment. Details? Call your General Motors Diesel distributor—he's in the Yellow Pages under "Engines, Diesel"—or mail the postcard today.

GM DIESEL

DETROIT DIESEL ENGINE DIVISION,
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In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario
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POWER LINE Sets the standard of Diesel productivity

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BIG MO Tractors

Big MOLINE capacity... matched

Real Backhoe capacity– Moline-built for easier, safer operation

This powerful, fast-cycling backhoe digs 12 ft. 6 in. at any point in a 190° swing with 7,000 lbs. of digging force at point of bite. Hydraulic wrist-action bucket digs straight sides and square corners. Offset operator seat pivots with the boom to allow continuous, unobstructed visibility of bucket throughout operating arc. Individually controlled hydraulic outriggers, sealed ball bearings at all major wear points and wide range of bucket types are typical advantages.

backhoe-loader...shuttle reverse

SPEED YOUR WORK CYCLE with the powerful new BIG-MO TRACTORS and *no-clutching shuttle reverse!* You load under full power . . . back away fast—dump . . . and you're in for the next bucketful while other tractors are lagging far behind! It's *all* done with a flip of the lever!

And the BIG-MO TRACTORS come equipped with *matched* backhoe and ¾-yard loader—you can get other *matched* equipment if your jobs require it. Parts and service are immediately available from your nearby Moline dealer.

BIG-MO TRACTORS are available in the "500" series with mechanical shuttle and standard transmission, or in the "600" series with Moline toe-operated hydraulic shuttle and torque converter drive. See the BIG-MO backhoe-loader at your Moline Industrial Dealer or mail coupon today!

ROGER HIPWELL—PHONE WEST 8-2771
Industrial Sales Manager
Minneapolis-Moline, Hopkins, Minnesota

☐ Send me name of my Minneapolis-Moline Industrial Dealer

☐ Send me catalogs on the new BIG-MO TRACTORS.

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MINNEAPOLIS MOLINE *

The fastest-growing line of industrial equipment!

*Moline Dealers give the best part service in the industry.

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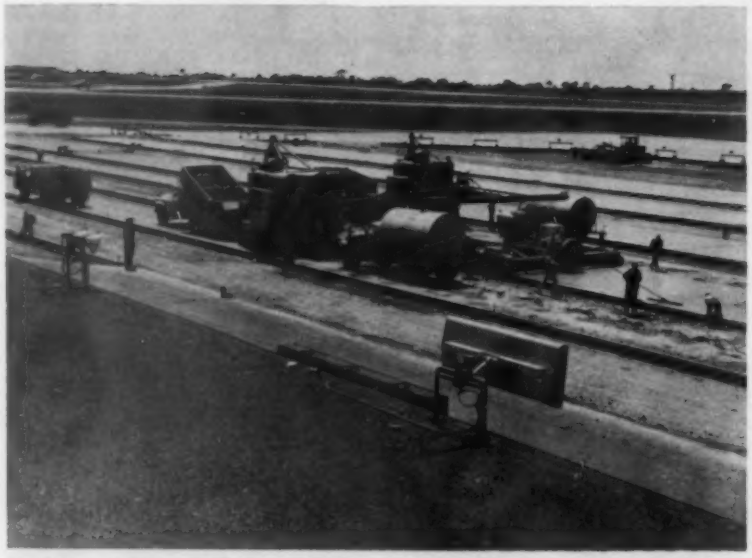

Rubber Tired Wheels Move Finisher Between Lanes

Single and dual drum concrete pavers, and a dual capacity finishing machine seen in use by Huron Construction Company, Limited, at Chatham, Ontario, to pave aircraft taxi and parking areas at Malton Airport, near Toronto. One of the 34E Blaw-Knox concrete pavers—the dual drum unit—placed nearly 1,000 cu. yd. of 12-in.-thick concrete per day. The Blaw-Knox finisher spread and finished concrete moving over B-K self-aligning airport paving forms. The finisher was modified by the contractor to include two 45-in. diameter rubber-tired wheels. These lower for tow-type travel between paving strips, and reduce time-consuming trailer loading and unloading of the unit for job-to-job hauling.

$105,000 Damage Awarded for Icy Road

Damages of $105,000 were recently awarded to the family of Stewart E. Jennings of Forestville, Maryland, who was killed in 1956 in an accident on Suitland parkway.

The parkway is under federal jurisdiction. The contention of the Jennings family was that the government was at fault because the car skidded on a patch of ice that should have been removed, and collided with another vehicle.

The government maintained that there was no ice present, but only slush and that scraping, plowing and sanding had been done where needed.

Judge Watkins of the Federal Court in Baltimore in ruling against the government said drainage in the area was improper causing water to stand on the road. This in part was caused, he said, by faulty landscaping done for another lane on the parkway. He also said that the government should have been more thorough in its sanding.

Traffic Safety

Traffic Control Through "Logic Circuits" Studied

An electronic warning and control system, a possible first step in the creation of the much discussed "automatic highway," currently is under development by Ohio State University researchers.

The project, being conducted by Edward K. Damon, assistant supervisor at the Ohio State Antenna Laboratory, makes use of recently developed "logic circuits" in warning drivers of various traffic conditions and in control of traffic flow.

It has as its goals the development of safer highways, the control of traffic density, the insurance of driver convenience, and economy, in so far as making use of available roads is concerned.

In Damon's plan, a highway would be divided into equal sized sectors. As a vehicle passed each area, its presence would be detected electronically and its speed and location noted. Similar information on all other vehicles on the road would be gathered.

These facts would then be operated upon by the logic circuits which could determine potential hazards to the vehicles in each sector.

Through use of visual or audible signals within the car, or by use of automatic roadside signs, these conditions would be relayed to the individual driver concerned so that he may take the necessary corrective actions to avoid collisions.

Started about four years ago under Dr. Robert L. Cosgriff, associate professor of electrical engineering, the research has been supported by the Ohio State Engineering Experiment Station and the Ohio department of highways. The system would be used to warn drivers of traffic problems such as traffic jams, accidents, and bad weather conditions. Also to control traffic light changes according to traffic volume and direction of flow.

In such a system, the so-called "blind passing" on curves and hills would no longer be a hazard, as the drivers could be told instantaneously whether or not a car was approaching from the opposite direction.

This fact alone, the scientists say, would increase greatly the capabilities of two-lane highways and therefore provide more economical use of present roads and greater economy in future construction.

Thus far, Damon has built various component sections of the system. The next step will be construction and investigation of a model system. The researchers emphasize that the day of the much-publicized completely automatic highway is still far away. Such highways will come about only through "guided evolution," a slow process requiring financial support for research and gradual public and governmental acceptance.

The proper use of Columbia Calcium Chloride on unpaved roads will save about 75% of the annual aggregate replacement and blading costs in addition to giving a smooth, dust-free riding surface.

Here's how to make your unpaved roads firm, compact and dust-free with Columbia Calcium Chloride

Year 'round performance of unpaved roads depends largely on proper early spring maintenance. This consists of shaping roads to restore proper crown and adding binder soil or aggregate to consolidate the surfaces. Then add Columbia Calcium Chloride to:

1. PRESERVE ROAD MATERIAL—Columbia Calcium Chloride keeps road surfaces from becoming too dry and deteriorating.

2. REDUCE BLADING REQUIREMENTS—Compact surfaces resulting from Columbia Calcium Chloride application support traffic loads better; there is less tendency for rutting and the need for re-blading.

3. PROVIDE BETTER BEARING—Columbia Calcium Chloride helps pack well graded mixtures tighter and denser.

4. CONTROL DUST—Columbia Calcium Chloride absorbs moisture from the air to keep road surfaces slightly damp; dust doesn't form.

Early spring application of Columbia Calcium Chloride means smoother, longer wearing roads, savings on maintenance and material, and satisfied motorists. Plan now to make all your unpaved roads trouble-free Columbia Calcium Chloride roads. For more information, write to our nearest District Office or to our Pittsburgh address.

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Cleveland 140 digs 38-mile Idaho gas extension

Massart Construction Company of Spokane, Wash. used a Cleveland 140 to dig a 38-mile gas line eastward from Moscow, Idaho to serve a new refractory at Boville, another brick plant at Deary and smaller users along the line. The Cleveland dug the line 40 inches deep for 4 and 6-inch pipe at a rate of better than 2 miles per day.

Typical of the entire Cleveland Trencher line, the 140 provides over 30 non-slipping digging wheel speed-and-power combinations—a choice that gives maximum trench production in all soils and terrains with greatest economy for every type and size of digging within its range.

For gas distribution and service lines, for gathering and transmission lines... for pipelines of every kind... for water and sewer lines... for drainage and irrigation systems... for every trenching requirement... for dependability, speed and economy... nothing digs trench like a Cleveland.

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Editorial

NBCA'S Quality Program

This issue carries a progress report on the unique Quality Improvement Program of the National Bituminous Contractors Association.

Announced early in 1959, this program is a trailblazer. It marks the first time that a large group of contractors has ever banded together to undertake basic research for the purpose of helping to better its type of construction. As an example of enlightened self-interest the NBCA program would be hard to match in any field of business.

The self-interest here is obvious: as bituminous construction is progressively improved, the competitive position of this type of paving will be maintained, and contractors who have invested in hot-mix plants and paving equipment will be assured of a more rapidly expanding market for their services.

Quality improvement efforts are not new in the contracting picture. The entire construction industry and the owners and the public have benefitted beyond measure by the platform of integrity and honesty in dealings set up and vigorously pursued by the Associated General Contractors of America. And contractors through cooperative committees have worked locally with the highway departments to develop better specifications. The NBCA program's uniqueness lies in the extent to which the Association is delving into engineering.

After a year of preliminary work, this effort is starting to get into specifics. The Association has wisely decided to let the universities and independent laboratories do its research, and to serve when invited as coordinator on selected state highway department studies. It is hoped that equipment manufacturers and material suppliers will contribute funds and lend their council in these studies, which are being financed chiefly by voluntary contributions from hot-mix contractors in the membership.

At this point, it is worth passing thought that the program will ultimately succeed only to the extent that each contractor reflects the enlightened attitude, and individually strives to do good workmanship on every project he builds. In a sense the 12-man quality commitee of the Association is really just the spearhead of a 600-company quality committee.

But the contractors in bituminous or any field of highway construction cannot be expected to do more than their share of the quality control job. As this research bears fruit it is hoped that the highway departments will reflect new findings promptly in their designs, specifications and construction manuals and that they constantly strive toward better field inspection and testing. Getting a well-built road of any kind is everybody's job.

—Harold J. McKeever

Catching equipment during noon stop. Talbott Construction Company's US 27 reconstruction south of Louisville.

Planning Your Fuel Supply Will Pay Off

Suggestions for delivery, storage and dispensing of engine fuel on the job

Roads and Streets Special Staff Roundup

Corn and oats kept the grading teams going in the old days. Now it is motor fuel—chiefly diesel and in huge gallonages—that makes the mechanized road-building job hum. Fuel supply is worth careful planning because it represents a respectable percentage of the total job cost. Also, refueling hitches mean job stoppage, and poorly planned handling runs up costs.

Here are a few facts and suggestions gleaned from a season's field observations and talks with industry men.

Fuel Cost

Of course no two jobs are quite alike in fuel consumption and cost, but a few general figures may help you see if your own costs are in line:

Fuel cost not counting trucks, tanks, handling, labor, etc., usually runs 4 to 7 percent of the total costs on highway earthmoving and rock grading. The range is 2 to 6 percent for jobs where paving or surfacing is a chief item, and 1 to 2.5 percent for jobs chiefly structure work.

Example: a Chicago contractor firm, J. M. Corbett Company, which has handled numerous urban expressway projects, reports fuel cost (largely diesel) at 5.3 percent of a recent job that was mostly grading (400,000 cu. yd.) with haulaway by heavy over-the-street diesel trucks. This firm's fuel bill was 2 percent on another job, entirely asphalt paving, and 1.5 percent on a ready-mix paving and structure project.

Generally confirming the above averages, figures on Oregon state highway projects (taken from cost breakdowns furnished the state by contractors) show that fuel represents about 5.0 percent of the total job for grading work, and ranging from 4.5 to 6.3 percent. For paving work, the average is 4.2 percent, and the range 2.7 to 6 percent for individual jobs. For structure contracts, the average is 1.2 percent, with range of 0.4 to 2.2 percent. (These figures assume that fuel represents 80 percent of the combined fuel and lubricant costs reported.)

Another source also confirms these ranges. LeTourneau-Westinghouse engineers say 4 to 7 percent is the general bracket to keep in mind for the earthmoving project.

Costs for fuel *handling and storage* are not so easily pinpointed. Where the fuel distributor fills the equipment tanks directly from a roadside delivery point, the contractor has no handling cost (except that figured into the unit fuel price by the supplier). On other jobs he may find that trucks, tanks, pumps and labor for rehandling and dispensing run into thousands of dollars a month. Remember that even an old truck refurbished to serve as a fuel hauler costs money, and $3,000 a year is

How big a tank can you handle on skids? Boyd Construction Company, of Mississippi, successfully used this 6,000-gal. tank on special heavy drag runners.

a low estimate for the cost of a newer truck, not counting driver wages. The contractor needs data from previous jobs to estimate these items accurately.

Fuel Consumption

How *much* fuel will the job take, and at what rate? Here again, there are some general figures to guide the estimator.

You can expect to use about 110,000 gal. of diesel fuel per 1,000,000 cu. yd. of scraper production for an average grading job using 18-yd. self-propelled scrapers on a 1,500 ft. haul. This figure comes from LeTourneau-Westinghouse.

Hourly consumption for a typical scraper team, according to this firm's engineers, will run about 35 gal. per hour for five 18-yd. rigs, 16 gal. per hour for two 200-hp bulldozers, and 3.5 gal. for heavy motor grader duty, or 54.5 gal. per hour for the spread.

The accompanying table from Caterpillar Tractor Co. shows the range of typical consumption for various machines in this company's line. Again the figures are indicative only. They represent steady operation, by the way; if your machines are intermittently idle, the day's fuel use will be lower.

Other typical hourly diesel use figures: 3 to 4.5 gal. for a 12-yd. rear-dump; 5 to 6.5 gal. for a 1½-yd. shovel; 5 to 8 gal. for a 2½-3-yd. shovel, 7 to 9 gal. for a 3½-4-yd. dragline.

For what it's worth, the Bureau of Public Roads has compiled figures for consumption of petroleum products on road projects. Estimating lubricants as well as fuels on a gallonage basis, the average rural interstate road job uses 167,000 gal. per $1 million of construction; for urban interstate, 89,000 gal. (fuel accounts for 90 percent or more of this gallonage).

Safety Precautions

Gasoline requires extreme care in handling at all times and places, due to its volitility and inflamability. Diesel fuels, too, must be handled with sensible safety rules in mind. With both fuels, or

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ARBA Convention Challenges Contract Controls, Other Slow-Downs

For contractors, management training for consultants, bigger share of engineering jobs, among varied convention topics.

Special to Roads and Streets
By Duane L. Cronk
Director, Highway Information Services

The annual convention of the American Road Builders' Association is traditionally the family reunion of the highway construction industry. It is an occasion for reviewing the developments of the past year, appraising the prospects for the year ahead, and airing those broad problems that beset the fraternity, particularly at the national level.

This was the formula that drew 1,500 contractors, materials producers, equipment manufacturers, and federal, state, and local highway engineers and officials to the meeting, held January 18-21 in Cincinnati. Here in the heart of a state that is pushing a $340-million roadbuilding program—and which annually manufactures $265 million worth of construction equipment—the roadbuilders listened to an array of Washington advisors, did a bit of deep thinking, and closed their annual get-together with some rather strongly worded resolutions.

Here are nine of the suggestions the convention adopted, all of which indicate the way ARBA will attack specific problems affecting the highway fraternity this year:

1. State highway departments be required to maintain complete records of all the direct and indirect costs of engineering services on federal-aid work, that those records be opened to the public, and that they be in some form which will permit comparison with engineering prices obtainable from private engineering firms.

2. Consulting engineers be pre-qualified as a condition of their employment on federal-aid projects.

3. Contract controls be eliminated by direct Congressional action, and the traditional procedure of permitting states to contract the full amount of their apportionments be restored.

4. The Federal-Aid Airport Program be extended for five years with the provision of $100 million a year in federal funds.

5. A renewed effort be made to utilize the free enterprise system as much as practicable in the National Highway Program, and that special efforts be exerted to encourage the participation of small business in highway work.

6. The federal Davis-Bacon Act not to be applied to workers engaged on ABC highway work construction projects or "extended in any manner whatsoever."

7. Congress not yield to pressure to change the 90-10 matching formula on Interstate projects.

8. There be no slow-down of construction of urban links in the Interstate System, but that the entire network be pushed to uniform completion as Congress originally planned.

9. Congress continue to increase federal-aid for the ABC Systems approximately $25 million per year, in spite of Administration recommendations that these funds be held to the current level.

Continued on page 104

Looking north from an elevation of 800 ft. over Beverly Hills.

Biggest Homesite Grading Job

One of the largest earthmoving projects ever undertaken for residential purposes is under way in the Santa Monica Mountains in back of Beverly Hills, California—here 8,000,000 cubic yards of clay and granite is being moved to provide 520 terraced residential building sites overlooking Los Angeles, Beverly Hills and Santa Monica. The finished plots averaging one-half acre in size range in price from $40,000 to $100,000 each.

The firm of J. A. Thompson & Son Inglewood, California, has been continuously active on the earthmoving part of the development since it started in 1954. To date Thompson has moved over 6,000,000 cu. yd. of material. Mountain tops and ridges have been flattened and the steep brush-covered slopes have been transformed into a spectacular

stairway of terraces rising over 800 ft. above the coastal plain.

"We have one fill over 200 ft. in depth," states Gail Sims, chief engineer for developer Paul W. Trousdale & Associates. "We have a number of fills here in excess of 100 ft. and several cuts in the neighborhood of 100 ft."

Earthmoving procedures have been complicated by the steepness of terrain and the design of the terraced lots. While each piece of property must be readily accessible to roads, street layout could not be such as to compromise the view and value of any part of the area. Each terrace has to be high enough to permit a resident an unrestricted view over the top of the home in front, yet the total grade of these relatively shallow "steps" could not be too steep to permit a direct route for roads having a maximum 15 percent grade.

"One of our first jobs was checking for springs in the lower parts of the canyons to be filled," reflects Sims. "In some areas we put in extensive French drains. In others we re-routed the flow." The dryness of the area, it should be pointed out, has made it relatively easy for underground water sources to be located.

To assure stability of the fills, canyon slopes were benched out in 8 to 10 ft. ledges to the top of each fill, the clay and alluvial overburden being mixed with the decomposed granite fill material as the work moved up the canyons.

"We're maintaining a minimum 90 percent standard compaction," states Marvin McCoy, general

Early stage in terracing job—dozers making steep push into loader trap below.

superintendent for J. A. Thompson. "Soil compaction tests are made for every 2 ft. of fill depth. To date we've run in excess of 5,000 of these tests."

The majority of the lots, however, are actually carved out of the mountainsides. The facing terraces have a 1:1 slope. Only a few of the lots are made up of fill material and these have a facing escarpment of 1½:1.

This careful arrangement of lots demanding the maximum use of undisturbed 1:1 facing presented Marvin McCoy and his foreman, Ray Jones, with some operational problems. It meant that haul routes had to conform to street layouts—a satisfactory arrangement as long as the streets and adjacent lots were accessible to both cuts and fills.

When operations moved into the steeper ridges where large cuts were required (and where lots are of greater value!), working areas could be reached only by long circuitous haul roads cut around the mountains or by cutting through the terraces. Neither idea was acceptable. The haul route on the mountainsides was "out" because of its expense, and the more obvious route through a 1:1 terrace objectionable because of the damage done to lot layout by the 1½:1 fill that would eventually close a haul road.

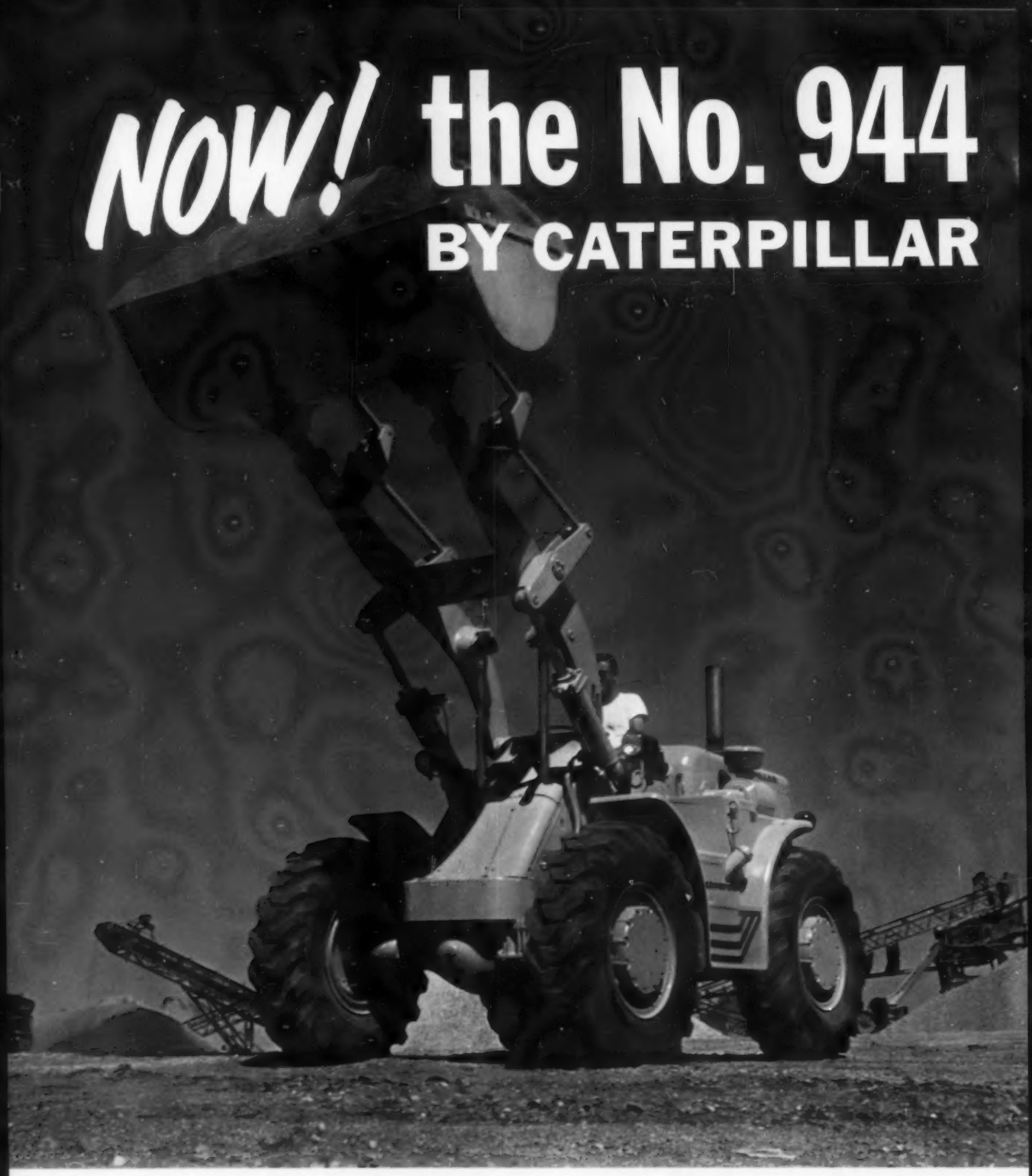
"We've licked this problem by building up belt loaders which enable dozers to work material from one bench down to the loading end of our belt located on the finished bench below. The discharge of the belt loaders permits our scrapers to use finished lots and access roads as haul routes."

The system has not only relieved the routing problem, but has rewarded J. A. Thompson & Son with an efficient earthmoving procedure. Considering that scrapers are loaded by dozer and belt, the yardage moved per equipment-hour is remarkable.

"We can average over one 24 cu. yd. load per minute with this belt," states foreman Ray Jones. "Just last week we tallied 79 scraper loads in a single hour with one of these belts." This loader is a Coleman 303 modified by J. A. Thompson. Original power was supplanted by a Caterpillar D1300 diesel power unit driving an Oilwell 10:1 box through a

Continued on page 85

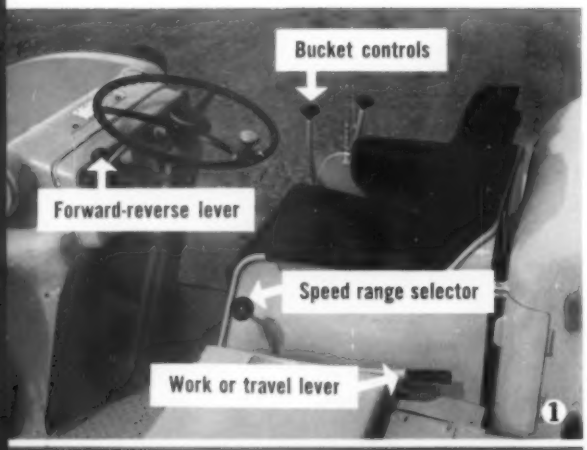
NOW! the No. 944
BY CATERPILLAR



THE *FIRST*
OF A NEW WHEEL LOADER LINE

the No. 944

...designed for action,



IT'S HERE . . . the Cat No. 944 . . . rated at 2 cu. yd. capacity . . . the first of a completely new line of equipment that will soon include the No. 922 (1¼ cu. yd. bucket) and the No. 966 (2½ cu. yd. bucket).

Watch for these new machines with the bold new design . . . they're ready to bring new standards to wheel loader operation.

Take a look at the No. 944's big, new features . . . features that give it lively response and make it the easiest and safest wheel loader to operate. See it in action at your Caterpillar Dealer. Ask him for a demonstration. See for yourself how the *new design* pays off on your loader jobs.

DESIGNED FOR ACTION . . . with plenty of power for both machine drive *and* bucket hydraulics. Choose from two great, new engines . . . the compact 4-cylinder diesel, turbocharged for maximum efficiency . . . or the 6-cylinder gasoline engine. Both are 105 HP units, fully equipped. Both are made to the same rigid standards. Whatever the requirements of your operation, there's a No. 944 powered to meet your needs.

Tailored to this power is the torque converter and power shift transmission, providing smooth, instant, finger-tip shifting. A full range of work and travel speeds is available on the No. 944. And reverse speeds are 25% faster than forward speeds . . . important in reducing cycle times. Travel Range gives 2-wheel drive for roading . . . Work Range automatically puts power to all 4 wheels.

Machine and bucket controls are located for easy handling(**1**) —the forward-reverse lever is mounted on the steering column.

Both bucket control levers have kick-out devices. The lift control releases at dumping height—the tilt control positions the bucket for digging. And for full bucket loads every pass the 2 cu. yd. bucket tilts back 41° at ground level. The high lift and *extra-long reach* make truck loading faster, easier.

There's plenty of action designed into the No. 944, ready to speed up your loader jobs.

DESIGNED FOR SAFETY . . . in the bold new lines(**2**). Bucket lift arms and pivot points are completely in front of the operator's area. This gives the operator new freedom of movement . . . greater all-around visibility.

Wide steps(**3**) make it safe and easy to get on or off . . . from either side. No need to climb over tires. Fenders provide a handy platform for checking the engine and they protect the operator from rocks and mud(**4**).

The No. 944 brake system gives safer, more precise control(**5**). The *left* brake neutralizes the transmission *as* it stops the machine. This gives superior loading action in extra-tough material.

Traxcavator safety, economy

The *right* brake leaves the transmission engaged . . . for full control when creeping, working on steep slopes or roading downhill.

These and other safety-bonus features give the No. 944 operator greater confidence, greater efficiency.

DESIGNED FOR ECONOMY . . . in the Caterpillar tradition. Sound engineering, modern design, service accessibility, quality construction, responsible parts and service coverage all add up to a new kind of stability—mechanical stability—in the No. 944. The many cost-saving features of this NEW wheel loader will pay off big in your operation!

Offered in a full line of versatile attachments and accessories are forks, cab(**6**) and special buckets, including the *exclusive side dump* that gives the No. 944 added efficiency.

BRIEF SPECIFICATIONS

Horsepower (Net)	105*
Bucket capacity	2 cu. yd.
Bucket reach (@ 7 ft. dump height)	50¾ in.
Over-all width (bucket)	93½ in.
Wheel base	88 in.
Speeds, forward (4)	0-24 MPH
reverse (4)	0-30 MPH
Weight, shipping (with diesel engine)	20,780 lb.
(with gasoline engine)	20,440 lb.

*For comparative purposes, the maximum rating of the D330 Engine used in the No. 944 is 135 horsepower.

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Every feature is designed for *efficient work*. Plenty of horsepower . . . finger-tip shifting . . . smooth, fast bucket action . . . outstanding operator comfort and safety. The result is the bold, new No. 944 . . . the *outstanding* performer in its class!

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A GREAT NEW PRODUCT IN THE CATERPILLAR TRADITION

Constructive Cost Controls for Contractors
No. 3 in a Series

General Expenses Vs. Better Profit Control

By James P. apRoberts
Cost Control Specialist, Chief Estimator,
Pomeroy and Associates,
Pasadena, California

In the two preceding articles of this series, the general subject of cost controls as they apply to a typical roadbuilder was introduced —and then followed by a discussion of various side sources of income which a contractor may have within his grasp to improve his profit picture.

By way of acknowledging the considerable reader interest which is beginning to develop in this series, we shall now probe into one of the most important phases of cost controls for contractors, namely, the analysis of expenses in general.

Comments and requests by readers of Roads and Streets for a discussion of any specific cost control problems are always welcomed. Whenever possible these articles will be tailored to fit in with *your* needs and situations or interest in some phase of cost controls.

It was noted in the last article that a typical roadbuilder has only two classes of income—primary and secondary. In a given financial period of say one month, the number of "checks" or major payments which he will receive from these sources will be quite small when compared with the large number of individual payments which he must make. These are for his employees, material and equipment suppliers, subcontractors, for taxes—plus what often appears to be a small army of still other creditors eager for their share of his gross income.

As a result of this situation it is much easier for a roadbuilding contractor to work with his sources of income than with his sources of expense. There is far less work involved in identifying and measuring the amounts of income and at times even predicting the amount that will be coming in during a given period of time, than in trying to do the same thing with items of expense. But a fundamental opportunity comes along with the analysis of those unpleasant statistics on the "wrong" side of the ledger. Their tremendous importance lies in their usefulness in helping to develop useful yardsticks for measuring performance, productivity and even managerial ability.

Too many times, the pursuit of a large gross income—and what was thought to be a high dollar volume —by contractors with limited managerial talent, has been confused with what has been called "the frustrating art of trading nickels while finding new ways to wear out your equipment and lose good men". Income tells the roadbuilder how much he's going to make, but it's the *expenses of the job* that let him know what money he can actually keep!

So with those grim words in mind, let us take a much closer look at expenses and begin with the ways that they are defined by accountants, estimators and cost control standards.

An accountant will tell you that, very basically speaking, expenses are those entries which constitute a decrease in capital. Furthermore, expenses are entered as "credits" on asset accounts, because they represent an increase in liabilities and a decrease in assets. This in turn agrees with the basic formula for double entry bookkeeping, namely, "Assets equal Liabilities plus Capital or Proprietorship". Here in these few words is the foundation of costkeeping. Should reader interest indicate, we shall go further into this very important subject as it affects roadbuilders. However, our problem now is to get a closer look at what causes those decreases in capital!

If you allow your accountant to proceed, he will also tell you he considers that there are two major classes of expenses: (1) Operating Expenses and (2) Non-Operating

Form For Comparing Estimated and Actual Costs

U. & I. ROADBUILDERS, INC.

Estimate Summary

Estimate No. _____ Page No. __ of __
Project No. _____
Date Due _____
Date Prepared _____

Item	Description	Quantity	Unit	Labor Quantity	Labor Cost	Material Quantity	Material Cost	Equipment Quantity	Equipment Cost	Sub-Bids Quantity	Sub-Bids Cost	Total Base Cost	Over Head	Profit	Bid
1	Specified														
	Estimated														
	Actual														
	Next Competitor or Low														
	Comments														
2	Specified														
	Estimated														
	Actual														
	Next Competitor														
	Comments														
3	Specified														
	Estimated														
	Actual														
	Next Competitor														
	Comments														
4	Specified														
	Estimated														
	Actual														

Expenses sometimes called Other Charges. These same classes are also frequently spoken of as (1) Direct and (2) Indirect Costs or Overhead. With this important distinction in mind, the individual expenses are then separated according to their source of origin.

For example, when our hypothetical "U. & I." Roadbuilders, Inc., began to get some actual income, it contacted an accountant (a Mr. Sharp) who had spent some time in working with small, aggressive roadbuilding firms such as "U & I". Following this gentleman's advice, U & I's owners listed all of their expense items, and examined the nature of each one in order to try and reduce the total number of accounts listed on their books. As a result they simplified the handling of their expense accounts.

Following this, Mr. Sharp advised that the owners classify all of their expense items as Overhead Costs except those which could definitely be tied to an actual job. For a small company this definition offers the means for not only separating these two classes of expenses, but also of providing a working ratio of Overhead Expenses to Job Expenses. (Such a ratio should however, be handled with care, for the size and duration of the project will also be determining factors—Editor).

At this point it is worth observing that the approach used by many estimators in anticipating project costs is based on this method of classifying expense items. For example consider the accompanying abbreviated "L.M.E.S." Estimate Summary which is a composite of several estimators' tabulation forms.

This form represents a summation of direct job expenses together with the apportionment of indirect expenses (overhead and an allowance for profit). The form has additional merit in that when the contractor's bid is successful the sheet can be used for the ready comparison of anticipated costs and profits against the actual results. Furthermore, this type of compilation is also of value in studying competitive bids, in order to try and find the strengths and weaknesses of your own roadbuilding company as indicated by the various unit cost items. However, when such a study is made, it should be done of course with the realization that not all contractors think alike on the subject of unbalancing their bids.

Despite these good points, there is, unfortunately, one drawback in the use of any form which summarizes such costs as Labor, Materials or Equipment. That defect is the rigorous requirement that those costs should be based on valid supplementary data which can prove how these unit costs were developed. There are many times when, with the aid of information from the accounting section, cost studies can be made which can be used over and over again in computing the same type of unit cost. But without such information, it is very easy to see how (late in the evening before a bid opening), the temptation could be quite strong to take some unfortunate short cuts. The temptation might be to rely on memory and current prices, instead of making a more detailed analysis of the problems involved in estimating the costs of the proposed job.

On the other hand, when time and experience permit, the bid data which a qualified estimator may compile in substantiating his opin-

ion of what a given job should be "bid in" at, will be more than just an appraisal of the factors involved. For these data and resultant bid items will also represent a statement of "Anticipated Profits and Losses"!

This means that in the event of successful bids, such analyses and compilations should be used for a dual purpose. It is the means for guiding the Project Manager in programming and further pre-planning the job (if he was unable to assist in preparing the bid). But especially it is the means for setting up what is known as a "Schedule of Accounts": This listing or classification of accounts classifies and defines the various expenses which can occur on the job. Such a schedule should naturally be made with the cooperation of the Accounting Section because the personnel in this section (timekeepers, bookkeepers and accountants) in turn must keep the record of these charges.

Furthermore, a problem arises if there is a difference between the schedule of accounts proposed for the new job and the schedules or types of accounts used on earlier work of a similar nature. In such a case some kind of reconciliation must be made between the old and new cost breakdowns for such work items. It may not be possible to relate these costs when making cost or performance comparisons between a number of similar jobs. Then the data obtained by one or the other of the two systems will not be of much value.

Consider for example, a case in point which may illustrate how such a situation can arise. At one time the "U. & I." estimators had a way of classifying structural concrete costs according to the number of cubic yards in the structures involved. For those structures involving less than 2 yards, they would bid $125.00 per cu. yd.; from 2½ to 4 yards—$100.00; for 4½ to 10 yards, $85.00; over 10 yards in a single structure—well they had never had to bid on anything that big!

When the "U. & I." Company began to grow and to do more estimating, its people suddenly and painfully realized that size of concrete structures isn't the only factor affecting the cost. In addition to the quantity of concrete required, some other predictable factors must be considered. Among these are of course excavation, layout, forming, placing, finishing and curing. Now, the "painful" part of this finding was the fact that when it was decided to base concrete costs upon these factors, the cost data that had been compiled according to the older standards was of very little value. It was necessary to start afresh with new and different cost records which would show the revised breakdown of their concrete costs.

In fact, the closer you look at the definition of "expenses" as they apply to the analysis of construction costs and operations, the more evident a certain fact becomes: in a well integrated construction company there will be very little difference between the accountant's and the estimator's views on what constitute job or direct expenses. Each must realize the importance of realistically defining these expenses —in terms of the actual operations involved in each class of work. Then, these same cost items should be consistently used in recording and analyzing job costs.

Editors Note: The subject of General Expenses will be discussed further in Mr. apRoberts' next article, tentatively scheduled for April.

Davis-Bacon Act an Outmoded Law

The Davis-Bacon Act dates from the early depression days. It is outmoded, yet when the new Federal highway program was enacted in 1956, zealous bureaucrat and labor lobbyists succeeded in getting it written into the law.

It is costly. Your road use funds would go further — your construction program would move faster and everyone concerned would be saved miles and miles of necessary bureaucratic red tape if employees on Federal aid highways were paid local wage rates of the Secretary of Labor fixing them.

The Davis-Bacon Act unnecessarily and arbitrarily increases highway costs, slows down construction progress, dictates artificial job classifications, and gives red-tape headaches to highway administrators and contractors working on the Federal aid system.

The National Chamber of Commerce has already urged Congress to repeal the Davis-Bacon Act and is trying to prove to government administrators that it is unnecessary.— Do you reckon it would do any good if *you* let *your* Congressman know how *you* feel about it?

—From a Bulletin of the Virginia Road Builders Association.

Contractor's Big-Tired Marsh Rig

This unusual vehicle shown churning out of a swampy area, is built around Goodyear's unique Terra-Tires (5' high, 42" wide, 18" at hub). The "Model 400" buggy, designed and built by Crain Bros., of Grand Chenier, La., will be used initially for oil exploration and as personnel carriers.

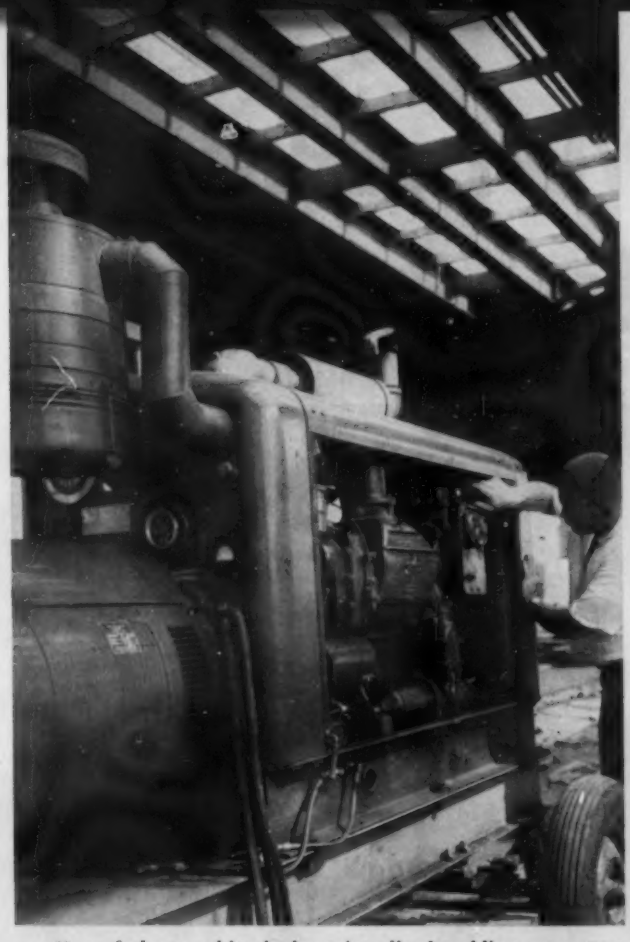
Watching the stud welding: Charles H. Clarahan. Jr. (center), chief designer for Howard, Needles, Tammen and Bergendoff, consulting engineers with W. R. Johnson of the subcontracting firm and Paul Butterfield of Nelson Stud Welding Division of Gregory Industries.

Big Welders Speed Shear Stud Setting

Six heavy duty stud welding guns were operated simultaneously on a New York City expressway viaduct, powered by the two largest single-engine diesel welding generators ever built. The work was the installation of stud shear connectors for the Bruckner Expressway in the Bronx.

More than 265,000 Nelson shear connector studs were end-welded to the girders, using NS-9 Nelson guns. The studs were for binding the girder steel and concrete deck slab together for composite action, this integral design representing a saving of about 15 percent in the amount of steel used.

According to Charles H. Clarahan, Jr., chief designer for Howard, Needles, Tammen and Bergendoff, consulting engineers, stud shear connectors also permitted easier placement of reinforcing bars for



One of the two big single-engine diesel welding generators, seen on the Bruckner Expressway project.

Four lines of big ¾-in. studs were required in this deck's composite design, 265,000 studs in the job.

the deck slab, at a saving in job cost.

During the first two weeks of September, 20 groups of bridge designers and highway engineers in the New York area inspected stud welding work in progress. Section I of the expressway, 5,337 ft. long, required 12,000 tons of structural steel and 2,300 tons of reinforcing. The shear connector studs measure 4" x 4¾".

The large welding generators used are self-contained, wheel-mounted Nelwelder FD units, recently built to handle large studs from ¾-in. diameter and up. The engine is GM Detroit Diesel 6-cylinder, 2-cycle, 2100 rpm water cooled, directly connected to the generator. It is equipped with an electric starting motor. Each generator furnishes power at 2,000 amp. (80 v.) sufficient to operate three NS-9 guns.

Studs are applied several times faster than other shear devices, according to W. R. Johnson, head of W. R. Johnson Associates, Inc., Mount Vernon, N. Y., which installed the connectors under subcontract with the general contractor, the Slattery Construction Co.

Stud welding is an electric arc welding process using a semi-automatic lightweight gun. Pioneered by Nelson, it is widely used in metalworking, shipbuilding, the railroad industry, and construction because it eliminates hand welding and permits rapid application of stud fasteners without drilling or punching base metal. The use of studs as shear connectors for composite decks is a relatively new application.

The Bruckner Expressway is part of the metropolitan program of the New York State Department of Public Works.

Tests Epoxy Resins

The various epoxy resins commercially available are being tested on bridges in the Connecticut highway system, under a program by the Division of Research and Development of the Connecticut State Highway Department.

Seven chemical companies are participating in the installations which were made last Fall on the Raymond E. Baldwin and the Gold Star Memorial Bridges.

The tests are designed to determine to what extent this material may contribute to non-skid qualities of bridge decks, aid in repairing potholes and scaled areas, and serve other protective maintenance purposes.

Cat crawler-drawn short work of mean

Scrapers make mountain hauls

A canal across a mountain! That's the job this contractor's doing in Colorado. Brannon Construction Co. is building an irrigation canal from Vega Dam near Collbran to agricultural areas 18 miles away. To make the mountain job even tougher the canal path is mostly rock. Hauls are short—1000 feet maximum. There's little room for turning.

Brannon Construction got set for the job with a spread of three Caterpillar D8 Tractors, two No. 90 Scrapers, a D9 and a D7. A Cat No. 12 Motor Grader—used for sloping the canal sides—completes the spread.

Each D8 pulls a No. 90 Scraper, while the D9 backs them up with its mighty pushloading force. The D7 dozes and pulls a sheeps-foot roller. This efficient spread moves about 4500 yards a day. Even with tricky mountain maneuvering, scrapers make 5 to 6 minute cycles.

This application is another demonstration of the efficiency of crawler-drawn scrapers—on the short hauls, for the rough ground and underfoot conditions that are mean and tricky.

This is exactly the kind of going that Cat crawler-scraper combinations can convert to high production. They're self-loading or, for even higher production, they can be pushloaded. And with the added brawn of recent improvements, Cat crawler-drawn Scrapers haul bigger loads, last longer. Your Caterpillar Dealer has four-wheel Scrapers to match the D9, D8, D7 and D6 Tractors and to fit different hauling needs. And he has the tractors to match any job that comes your way! New 335 HP D9 Series E . . . the new D8 Series H—up 44 HP to 235 . . . the 140 HP D7 Series D. See your Cat Dealer for the quality equipment . . . before you bid on your next tough job.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

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BORN OF RESEARCH
PROVED IN THE FIELD

POWER SHIFT TRANSMISSION MAKES THE D8 AND D9 EVEN MORE NIMBLE

Shift on-the-go under full load in a split second. No more clutching. Shift in a single motion with a flick of the selector lever. Even when conditions are as tough as those above, operators will move more dirt with the new Cat power shift transmission.

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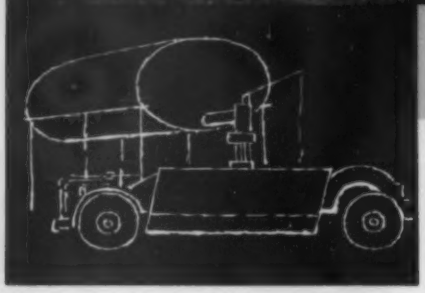

10,000 GALLONS AT A CRACK!

...MEANS FEWER TRIPS TO WATER-UP, MORE TIME SPRINKLING

Yuba-Southwest big gallonage sprinkler tanks cut costs, speed up the job: sizes up to 10,000 gallons

Yuba-Southwest also manufactures
MULTIPLE-BOX COMPACTION ROLLERS
SELF-PROPELLED ROLLERS
SHEEPSFOOT ROLLERS

Yuba-Southwest Semi-Trailer Sprinkler Tanks are designed and engineered to help contractors slash time and costs watering down big earthfills.

They are built in big-gallonage capacities only, ranging from 5,000 to 10,000 gallons, to reduce by as much as one-half the number of non-productive trips to the water source for tank filling. This minimizes a manpower cost problem ever present when conventional "piggyback" gasoline-type sprinkling tanks of small 2,000 to 3,000 gallon capacity are used.

Equipped with large, high-flotation, low-pressure tires, these big Southwest Sprinkler Tanks can work way out on deep, soft fill without losing traction or bogging down. With pressure spray bars both front and rear, and gravity bar under the tank, they provide faster area coverage with greatest possible water penetration.

Yuba-Southwest Sprinkler Tanks are adaptable for use with Caterpillar DW-21, DW-20 and DW-15 Tractors and other suitable prime movers. Various draft beam or hitch arrangements are available. Get complete information—today.

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Yuba Southwest Products are Sold and Serviced by Your Caterpillar Dealer

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3201 W. Mission Road, Alhambra, Calif.

YUBA CONSOLIDATED INDUSTRIES, INC.

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From four to seven bulldozers and rippers are kept busy feeding each of the skid-mounted modified Coleman loaders. The house of the loader shown is backed against the terrace escarpment permitting scrapers to be loaded at great speed without cutting into the 1:1 lot facing.

BIGGEST HOMESITE GRADING JOB

Continued from page 72

Twin Disc clutch. Thompson doubled the number of rollers, added a chain drive and strengthened the house. With the belt moving at 350 fpm, the loader handles approximately one cubic yard per second.

Earth can be moved by dozer and scraper with relative ease down to a depth of 30 to 40 ft. Below that depth granite and decomposed granite are met requiring drilling and blasting. In this operation Thompson is making extensive use of ammonium nitrate. "It is doing an excellent job for us and at a tremendous saving," notes Ray Jones. "We still use some 40 percent nitro, but wherever possible we've gone to ammonium nitrate for our blasting."

"Using a track drill and 365 cfm compressor, we're having good success with 3⅝-in. holes 12 to 18 ft. deep. We're using electric caps and load the holes with diesel-treated ammonium nitrate to within 6 ft. of the top. When we need a blasting mat, we roll a big Navy cargo net over the area and let 'er go."

Jones went on to point out that hole spacing is about one-half the hole depth. Where hole depth is less than 8 ft. or where the crew can't get at least 5 ft. of fill over the charge, 40 percent nitro dynamite is used.

Left and center: A special cutting extension on the dozer enabled this Allis-Chalmers HD21 to cut an accurate 1:1 slope back of one of the Trousdale Estate lots. Right: where accessibility permits, scrapers, rippers and dozers strip clay and decomposed granite down to finish grade of the lot.

Rock had to come out here. This is a good view of the terracing necessary throughout this huge "multi-split-level" development area.

While earthmoving equipment terraces lower slopes, a survey crew stakes out residential lots along the crest of the Santa Monica Mountains. Note how dozers in semi-circular area are keeping slope rim intact while feeding loader trap (not seen).

After shooting, bulldozers and rippers team up with Euclid PS 24's and Caterpillar DW21's in moving the material. However, dozers alone are used to move material to one of the two skid-mounted belt loaders when haul routes cannot be worked into overall lot design.

Fill compaction is handled by water trucks, sheepsfoot tampers and a Wagner compactor. The 1½:1 facings of lots built up from fill are watered, seeded with rye grass seed, then worked with a grid roller suspended from above. Individual lot drainage provides for all flow to go directly to the street rather than down the mountainsides.

The value of this property and its view of the Los Angeles basin are enhanced by the use of underground utility and power distribution facilities. Even television aerials, the bane of many otherwise spectacular residential communities, will be conspicuous by their absence—a common aerial mounted high atop one of the nearby ridges will provide unsurpassed reception for all residences in the Trousdale Estates.

Over 2,000,000 cu. yd. of clay and granite had still to be moved as of late 1959. This includes some of the ridges making up the crest of the Santa Monica Mountains. While entertainment celebrities are already building and moving into palatial homes built on the terraces lower down, J. A. Thompson & Son were gearing for a final assault on the very top of the range. They expect the earthmoving phase of this super development to be complete by sometime in 1961.

Acetylene torch cutting away old concrete piers, after setting of cantilevered beams over new piers built 7 ft. to the right. Below, beams in place. Total cost of modification: $38,000.

'Buggy Spring' Beams Stretch Bridge Span

A novel cantilevered steel beam design helped rescue the grade separation bridge here pictured from untimely and costly demolition. The structure with 3-lane deck carries Kansas State Route K-58 and US 69 traffic over one roadway of the new Turkey Creek expressway in the vicinity of Kansas City, Kansas. Built five years ago before present plans for a 3-lane express roadway beneath could be anticipated, the existing structure provided clear span room for only a two-lane lower roadway.

Continued on page 90

Take your choice of jobs..

Take grading, stripping, and spreading jobs—including those that formerly required costly specialized machines and separate operators! Four-in-One "carry-type scraper" action lets you shave off layers of earth or sod with inch-close accuracy—and lets you *precision-spread* soil on-the-go. Note how 4-in-1 scraper action "boils" the bowl full, grading for a sidewalk on a new street!

Take over sticky materials loading jobs that stop ordinary "roll-forward" buckets cold! Opening the clam pulls the material from bucket surfaces—gravity pull does the rest—to assure positive dumping and positive self-cleanout, even of wet, sticky, clay-type materials! Your sticky materials problem is over with the 4-in-1 as this 2¼-cu. yd. TD-15 proves!

...and "take" your competition

...WITH EXCLUSIVE

4-in-1

CLAM-ACTION...

You can take slam-bang jobs, like old pavement removal, from far costlier boom-type rigs—using International Drott 4-in-1 power-shovel-like excavating force. See how this 3-cu. yd. TD-20 Four-in-One digs up reinforced concrete slab, tons at a time—applying up to 43,150 lbs. of famous pry-over-shoe break-out power!

See how industry-topping 4-in-1 work capacity—plus the tremendous work range of its built-in "equipment spread" of machine actions—equips you to take your choice of jobs!

Move the "job-action selector"—prove 4-in-1 ability to "take" competition—be it "single-action" loader, or a yard-full of other limited duty rigs. Compare exclusive shock-swallowing Hydro-Spring advantages, for positive performance protection. Let your International Drott Distributor demonstrate the 4-in-1 size you need. *Five big-capacity sizes: ¾, 1⅛, 1½, 2¼, and 3 cu. yd.!*

"Take" your bulldozer competition with 4-in-1 'dozer action—which can duplicate the performance of a full-sized blade in capacity, work range, and accuracy of control! Here, an excavating contractor is rolling the earth with his 1½-cu. yd. TD-9 Four-in-One's bulldozer action on landscaping work! Operator regulates dozing depth accurately with hydraulic "radius control!"

International Harvester Company, Chicago 1, Illinois
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'BUGGY SPRING' BEAMS SAVE BRIDGE

Continued from page 87

First examination of the site indicated that a 3-lane pavement could be squeezed into the space between center-span columns, but with painfully little shoulder room —a procedure vetoed because of the adverse accident history of such design compromises.

The fact that the lower roadway would be on a curve required more than the usual width in the adaptation.

The problem was to modify, rather than tear down and rebuild this reinforced concrete bridge. William Chalmers, design leader in the Kansas highway commission's bridge department, working with a team of designers, came up with the idea which was eventually executed, and is here pictured.

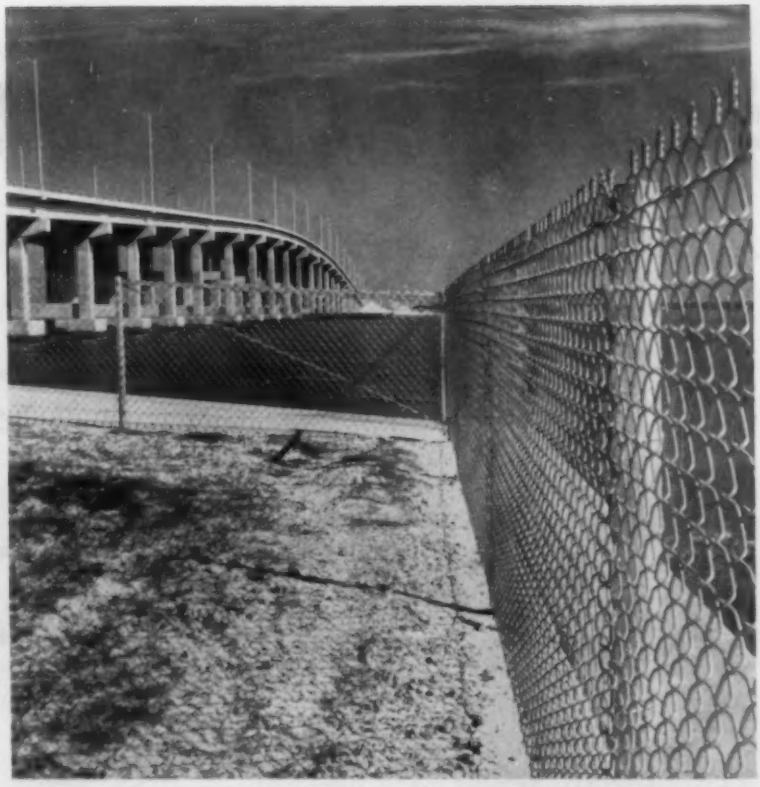
New pier bents were built 7 ft. back of the existing piers on each side of the under-roadway. Then, using a "buggy spring" device—steel beams cantilevered over the new pier on either side of the main or center span—the deck load was transferred from the old pier to the new, and the old pier then cut away.

The new piers are on steel piling with the footings tied to the original drilled shaft piers below the ground line.

There are six lines of beams under each end span—one pair at each pier column. The beams were bolted at either end to the underside of the continuous concrete deck slab. An important detail was the computation of the precise distance the beams had to be jacked downward at the abutment end before bolting, in order to insure proper load distribution at the two beam ends.

A sidelight on the job: jackhammer operators for the contractor, A. J. Tobin Construction Co., had a tussle with the old piers. It took four men two weeks to cut through the six reinforced concrete pier columns.

Said resident engineer Mark Roberts, "Anyone who might question the quality of our bridge concrete should have seen these old piers."



Showing part of the four miles of aluminum fencing, 270 aluminum light standards and two miles of aluminum railing used on the new Miami to Miami Beach Causeway.

Aluminum Chain Link Guards New Causeway

Four miles of aluminum chain link fence along the new 36th Street Causeway between Miami and Miami Beach highlight a pace-setting area used of aluminum road, bridge and electrical products by the Florida road department.

Said to be one of the longest aluminum chain link fences in the southeastern U.S., it joins a variety of other aluminum uses along the $14 million causeway, according to Reynolds Metals Company, a chief supplier.

The new causeway also utilizes almost two miles of aluminum bridge railing, 270 tapered aluminum light standards and over 22 miles of aluminum electrical conductor (first such installation by the road department). In addition, aluminum signs, both of the post and panel type and large road-spanning type, are used here as elsewhere on Florida highways.

Engineers chose aluminum here primarily because this is a highly corrosive salt water area and experience has shown aluminum requires little or no maintenance. Attractive appearance was also a factor.

It will be years before this mile-long, double-decked highway and railroad bridge has to be repainted. Every coat of the maintenance paint now being applied contains *M50* pigment.

Maine triple protects big Kennebec bridge with 3-deep, *M50*®"Defense-in-Depth" paint system

Did you know that you can now buy metal protective paints with anti-corrosion pigment in *all three coats* . . . primer, intermediate *and* finish?

Did you know that these "Defense-in-Depth" paints are so durable that primers alone . . . with no intermediate or finish coats to protect them . . . have endured *years of exposure?*

A relatively new pigment, *M50*® *basic lead silico chromate,* permitted development of these outstanding new-type metal protective paints.

And how they've caught on!

In October, 1956, Maine painted a small highway bridge in Minot's Corner with *M50* "Defense-in-Depth" paints. Small photos show you how that paint job looked in August, 1959.

Now Maine is giving its mile-long double-decked, Kennebec Bridge in Bath the same *M50* pigment 3-deep protection. Old surface is brush blasted then given an *M50* spot prime and an *M50* intermediate coat where needed. Final step is the application of 2600 gallons of an *M50* green finish coat.

As Maine goes...

. . . so goes the nation. State after state is completing its early tests of *M50* "Defense-in-Depth" paints and has big *M50* bridge maintenance painting jobs under contract or advertised for bids . . . Georgia, Missouri, New York, South Carolina. And many more to follow suit.

Your regular paint suppliers can make *M50* "Defense-in-Depth" paints. Ask them. For technical details on *M50* pigment itself in metal protective paints, write National Lead Company.

Above decks . . .

Below decks . . . First Maine bridge to be painted with *M50* "Defense-in-Depth" paints remains free of film defects. Bridge, at Minot's Corner, was painted 34 months before pictures were taken.

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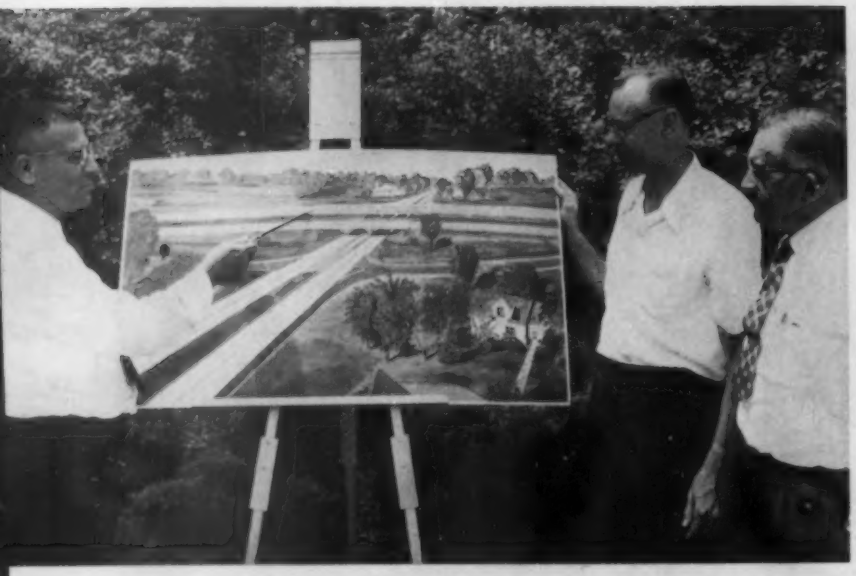


One of the king-sized oil paintings being used in Wisconsin. Design engineer J. S. Piltz is explaining the picture's use to engineers Irvin Herried and E. M. Every.

New Public Relations Tool: 'Highway Portraits'

By Cliff Hutchinson
Wisconsin Highway Commission

Highway portraits actually done in oil are Wisconsin's latest and most effective public education device. They are being used to win understanding and acceptance of proposed road projects.

Believed to be the first of their kind used in highway work, the king-sized oil paintings show accurately the general plan, as well as small details, of planned improvements.

Originally, state highway officials depended on showing blueprints and other technical sketches to local government officials, property owners, service clubs and others affected when plans for proposed improvements were announced. Even at formal public hearings, a set of plans was formerly the main, and frequently the only, visual tool. Since most citizens—and many county, town and city officials—are not trained to read or interpret blueprints, misimpressions, or no impressions at all, were common.

L. W. Empey, commission district engineer at Green Bay, recognized the need for a better visual device. He asked his staff artist, Reynhold Schenkelberg, to rough out an oil sketch of a proposed road relocation. The result is the painting shown.

Engineer Schenkelberg had previously created a dozen or more useful 3-dimensional scale models of proposed road improvements. These were extremely effective as visual aids at public hearings, and in talks before civic groups. But they were heavy, awkward to transport and lacked small details that were perfectly shown.

Producing paintings of this type requires a special talent, since the image on the paintings at the time they are made represents a non-existing physical situation.

Thruway Revenue Jumps

The New York State Thruway Authority collected $47,519,510 in gross revenue in 1959, an increase of 36.13 percent over the previous 12 months. The year's gross income comprised $31 million from passenger car tolls, $11.8 million from trucks and buses, $3.8 million from Thruway restaurants, service stations and emergency roadside repair service, and $0.7 million interest and miscellaneous revenue.

The McDougal-Hartmann heavy equipment maintenance shop. Three tractors at left are in various stages of overhaul. Machine shop is at far end.

Karl Wernle, shop superintendent, inspects Caterpillar D9 tractor on which every other track shoe has been removed to lessen shipping weight.

Checking levels in McDougal-Hartmann's battery department.

Upkeep Tips From a Medium Sized Contractor

By James R. Cummings
Associate Editor

The contractor today has his hands full keeping equipment maintenance abrease of expanding field operations. McDougal-Hartmann Company, Peoria, Illinois, is no exception.

But there's no harm in directing some overtime brainwork toward more efficiency in day-to-day shop operations—where costs mount up. As an example:

McDougal-Hartmann was confronted with the usual weight problem in transporting a Caterpillar D9 tractor between the firm's main yard and the job. Meeting Illinois highway load requirements meant taking off the track, and this meant tying up trucks, crane, operators and other personnel both at the plant and at the job site.

A new technique was suggested and now is standard practice with the company's D9s. Instead of taking off the track, the cable control unit is removed, fuel tank emptied, and every other shoe is taken off. On this last alone, taking off 38 of the 76 shoes on a D9 (a 27-in. shoe weighs 88 lb.) the weight of the unit is reduced 3,344 lb. And the tractor is still mobile enough to move on and off a low-boy trailer.

McDougal-Hartmann is a 12 year old contracting firm which does earthmoving, paving, bridges and subdivision street work. The year 1959—with a gross of over $5 million—was a busy one. But by December 1 the work was tapering off. A 7-mile Interstate job in Indiana with 500,000 cu. yd. of earthmoving was shut down, and another 500,000 cu. yd. road job in Illinois was reduced to cleanup work and maintaining detours. A good share of company attention, therefore, was shifted to the Peoria shop.

Tractors in for overhaul were slated to get a complete motor tune-up, a check of cable control unit, steering and track assemblies, then are steam cleaned and spot painted.

McDougal-Hartmann has been getting about 1,500 to 2,000 working hours from a set of D9 track under rough operating conditions, according to shop superintendent Karl Wernle. And when this point is reached, the maintenance personnel always face the decision of whether to build up track components or buy new ones; with a D9, Wernle says, it's usually the latter though, he adds, with new D9 track now on the market they will probably be able to weld.

Much of the firm's grading work during 1959 was in sand and mud with resultant heavy wear on track bushings, pins and chain as compared to shoes and grousers. Rollers required build-up, which was considered consistent with the rough going encountered.

The tractor shoes removed for transport ("every other one") are kept off while the tractor is being overhauled. Special permission can be obtained from the state of Illinois for overweight moves within a distance of 60 miles, but the machine may be shipped further so it stays stripped until its next destination is known.

This contractor's leaders feel it would not pay to move all heavy equipment in from, say, its Indiana job just to look it over. Proper upkeep is insured however, by a 3-way system of checks. For each unit, Wernle keeps (1) reports sent in regularly by a field mechanic assigned to each job; (2) a work sheet of labor performed, whether shop or field; (3) copies of purchase orders of new parts. Equipment requiring major attention is brought into the shop; the rest, parked on the job on built-up ground, is provided needed servicing by two mechanics.

The company has added another phase to the wintertime maintenance of this "outside" equipment.

Assembling the roller suspension system for the stripped D8 in the background.

Array of various lube materials with dispenser pumps at the ready. Drums kept next to overhaul area for convenience.

Air entraining additive stored here over the winter, being kept indoors as an extra precaution to insure quality.

Once a month a man from the shop crew journeys to the job locations with a booster battery, starts up the various parked units, and runs them about briefly "to keep the joints loose."

The company's headquarters maintenance shop is a steady backstop in the company's efforts toward operational efficiency. Though the shop is of medium size—or perhaps because of it—the McDougal-Hartmann personnel are adaptable and can move fast to meet a sudden need.

To illustrate this flexibility, a LeTourneau Model LS scraper was brought in from a nearby subdivision development in East Peoria for some quick repairs at the plant. It was enroute to the scene of another (1,000,000-yd.) grading contract.

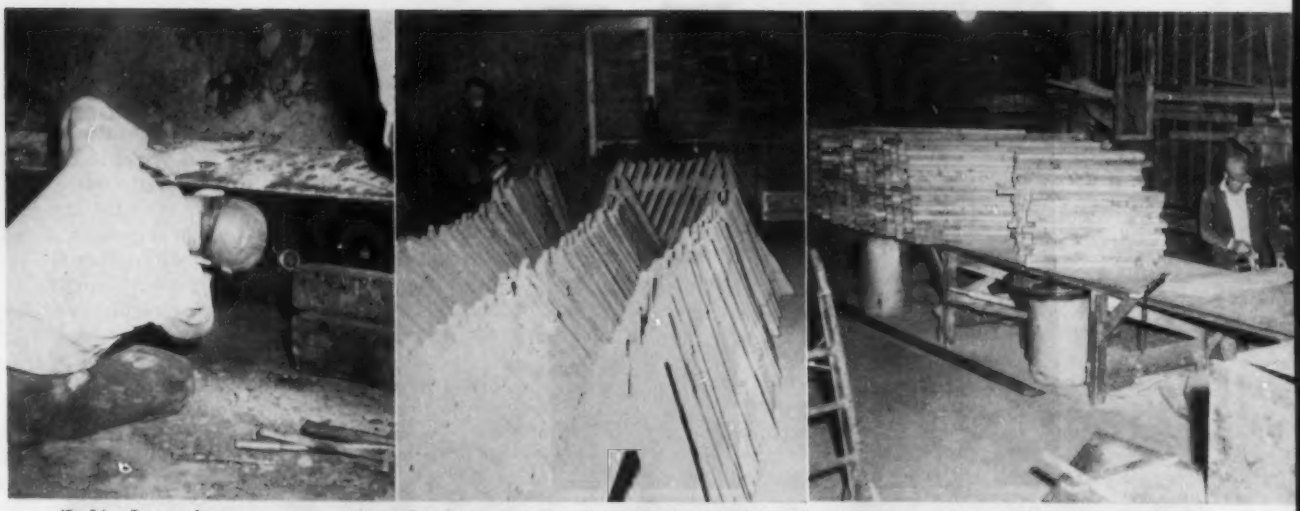
This veteran scraper needed new wheel bearings and a new cutting edge. Within a minute and a half —by an observer's watch—of the lowering of the big overhead shop door, two men were at work on the machine, one removing wheel lugs and pins and the other unbolting the blade preparatory to reversing it. This was at 3:30 p.m.; the unit was on its way first thing the following morning.

The company attaches great importance to the upkeep of its smaller equipment. Almost half of the total winter overhaul work is spent on saws, grinders, vibrators, form tampers, light plants and such. Men from the smaller nearby truck shop some in on days when there is little truck lube work and spend a 3:00 p.m. to 11:00 p.m. shift on the smaller units.

McDougal-Hartman has the conventional lineup of work bench equipment, but the shopmen take pride in the little machine shop established at one end of the Butler steel building. Because the volume of work would not justify full-time operation and supervision of this area, the company hired a retired machinist who works on a less-than-full-time basis. He has a drill press, a grinder and a lathe.

McDougal-Hartmann holds that efficiency and economy are partners. More examples of how they wed the two:

One corner of the shop comprises the battery service department for



(Left): Loosening a scraper cutting edge for reversal. (Center): Signs and barricades in the contractor's paint shop. (Right): Sawn 2 x 6's on table are for bridge deck joits, part of company's carpenter shop routine.

the firm's heavy equipment and trucks. Batteries are brought in here after an average 1,000 hours' service for a check of levels and casings and then are charged. The company averages 150 batteries serviced and reinstalled for every 20 new ones purchased.

A ready supply of Shell and Phillips 66 lube materials is maintained. This includes motor oils for the heavy units, hydraulic oils, and special oils for air compressors, etc. Most of the supply is kept in 55-gal. drums, with Bennett one-quart pumps for dispensing. The motor oils are ordered in 6-drum lots, a point at which the company gains a favorable price break.

Shop tip: Since some of the big units in for overhaul drink up motor oil 35 to 40 gallons at a time, the McDougal-Hartmann shop people simply bring a chain hoist over, pick up a drum and carry it to the machine, then tip the drum and dump the oil right in.

Two auxiliary activities in the McDougal-Hartmann Company yard are pictured.

The firm maintains its own carpenter shop with a full-time carpenter. Primary purpose is the prefabrication of all forms needed by the company in its road and bridge work. In the winter, the carpenter makes barricades, road signs, stakes. He builds or repairs tool boxes and chests and even fixes desks and installs air conditioning for the field trailer offices. In the busier summer season, up to three to five men work here.

R. D. McDougal and H. W. Hartmann are the company's owners. V. O. Hart is general superintendent, Monte McCord is supervising engineer, and Karl Wernle shop superintendent.

Note of Irony

The McDougal-Hartmann Company was hit by a strike of operators and laborers during May and June in 1959.

"And we had a 'shut-down' rain just one day during that entire two months," says Monte McCord, supervising engineer.

"Good Roads" Tours by State Groups

Two state road builder groups have recently sponsored informational programs in conjunction with other industry organizations and the state road departments.

The Alabama Road Builders Association decided to inform the state's Congressmen and representative citizens of Alabama's highway matters. The Governor declared a "Good Roads Day" for Alabama on December 10, 1959—on which 260 people participated in a tour and dedication of an Interstate project, ending with a banquet (nationally known speakers) for 450 people. The association expects to follow up with short "Good Roads Day" programs to civic groups throughout the State.

The Florida Road Builders Association in conjunction with other industry groups and the Florida state road department, sponsored a 3-day press tour of the state's highways to acquaint civic leaders with the problems and facts of the road program.

Watchfob Issued

A newly-designed watchfob-keychain featuring the International TD-25 crawler tractor or the Model 95 Payhauler is available from International construction equipment dealers. Pendant measures 2¼ in. by 2 in.

FASTER FIELD DECISIONS

Continued from page 24

sion Deputy Directors and their Division Staff. The Division Staff is parallel to our Central Office Bureaus; hence it is possible for them to handle most of the activities in the division without headquarters help.

Liaison is maintained between Columbus and our Division Offices through Field Engineers, each assigned to several of these divisions. This helps insure uniform application of our specification provisions, and also expeditious handling of special problems which demand prompt decisions.

If our Field Engineers consider that special problems demand more than their attention, they call upon our Construction Staff Engineers to serve in a consulting capacity. The headquarters construction staff men, in turn, decide whether or not it is necessary to have design personnel consulted on any details, and thus it is possible to make decisions without too much delay.

We emphasize, however, the necessity for our division offices to be handling the work and thus our efforts at headquarters are only in a supplementary capacity. As conditions demand, our field engineers also consult with the divisions in matters of personnel relating to the control on the projects; and they participate in the schools or training programs conducted for inspectors and project personnel.

For a number of years the Ohio department of highways has jointly sponsored a Highway Conference with Ohio State University. We have found this helpful in bringing together the key personnel of both the department and the university along with city, county and industry representatives, which makes it possible to explore new developments and procedures.

We have emphasized the desirability of obtaining college students for our summer work, particularly engineering students. This is most helpful in later interesting these engineers in joining the department upon graduation.

Considerable inspector training is done at the job level. In other words, we find it necessary to place new personnel with experienced personnel for a period, so that the new man can actually go through the operations he will be required to supervise later on another project. This works out very well, and quite often is necessary due to the necessity for expansion of personnel rapidly during certain periods of the year.

The Ohio Contractors' Association cooperates in our efforts to attain better working relationships with contractors. This group participates in the joint Highway Conference, as well as attending various meetings at both the Division and Central Office level, in which our personnel discuss problems in prosecution of work.

During the past two years the Ohio Contractors' Association has jointly sponsored with the Ohio State University schools for their supervisory personnel. We have noted a definite benefit from this activity at the job level. The department representatives cooperate with the Ohio Contractors' Association and the university in supplying leadership for various phases of these schools. The exchange of ideas have been most beneficial. The Ohio Contractors' Association also has sponsored a scholarship at the university for the outstanding civil engineering student.

As a means of furthering good construction, we believe the end-result specification should be used wherever practical and possible; however, it has some limitations which must be recognized. It is necessary, we believe, to give the contractor sufficient information as to the general procedures to be followed. This is so there will be no misunderstanding by potential bidders, who may not understand what is desired and will thereby be misled as to what they are actually bidding on.

The department is fortunate in having full radio coverage on all highway construction projects, either through portable base stations on major projects, or with cars equipped for receiving and sending. We have found this to be most helpful in extending our capabilities over greater areas and permitting us to make decisions more promptly.

In addition to other activities, jointly with the Ohio Contractors' Association, we continually examine our specifications for the application of new developments. Our proposed changes are reviewed with association representatives to make sure they are aware of the changes that are coming along, and also to incorporate their ideas. We find, of course, that contractors are more receptive to new and changing ideas if they are discussed with them preliminary to incorporating in the regular printed specification book.

Colored Pavement Made Possible by Esso Development

A technique which, it is hoped, will make multicolored highways and airport pavements "practical for the first time" is announced by Esso Research and Engineering Company. Synthetic materials (thermo plastics) compounded for these and other purposes appeared very promising in recent laboratory tests.

Possible uses foreseen include: airport runways (to differentiate landing areas); highway intersections and ramps (defining correct routes and speeds, i.e., "red" would mean stop or danger); multicolored home driveways and sidewalks; and colorful curbing or road boundaries.

The method involves compounding plastice materials with aggregate (such as rock or sand) to form about a 1-in.-thick upper pavement layer. The colorless plastics can be pigmented any color. Dr. William J. Sparks and Alfred M. Gessler of Esso, who worked out the technique, have filed patent applications.

A reported new advantage is the ability to color asphaltic mixes—heretofore a very difficult thing. Other advantages include resistance to motor oil and fuel spillage. The compounds can be mixed and laid with conventional equipment. Test sections have been built and others are planned.

Corrugated metal pipe under typical service conditions on the Pennsylvania Turnpike—heavy traffic load with a large percentage of tractor trailers operating 24 hours a day.

After 20 Years—

Penn Turnpike Culverts Get Inspection OK

By R. W. Rankin

Drainage Engineer, Armco Drainage & Metal Products, Inc.

How do corrugated metal culverts stand up with the passage of the years? Highway engineers always welcome fresh data. With this fact in mind, in June of 1959 the Pennsylvania Turnpike Commission granted Armco Drainage engineers permission to inspect the corrugated metal drainage structures on the original section of the turnpike.

Although the elapsed time between installation and inspection was only about 20 years, it was thought the performance to date would permit estimating the remaining service life of the structures.

The service conditions were found to be more severe than average. The pipes were generally in good condition, with estimates of the remaining service life ranging up to at least 60 years. It is of interest to note that the Pennsylvania Turnpike is one of the pioneers of our modern expressway system. Heavy traffic has necessitated resurfacing of a substantial portion of the roadway. Duplication of the existing tunnels will soon be undertaken.

Inspection of the culverts consisted of photographing each structure and making a detailed report on the following: location, diameter, length, estimated fill height, type of terrain drained, alignment and deflection; and from the material angle, the pH of the water, condition of bituminous coating and pavement, and whether rust was forming on any of the exposed galvanized metal.

Forty-seven pipe structures were examined representing sizes from 24 to 72 in. in diameter and lengths from 92 to 540 ft. Maximum fill height was approximately 80 ft. The terrain varied from rolling to mountainous; erosive conditions are quite severe. The pH of the water varied from 4 to 7, but generally was between 5 and 6.

Continued on page 103

BUILDING INTERSTATE HIGHWAYS....

OHIO—Roll-O-Matic Tandem and 3-Wheel Rollers working on Routes #3 and #62 access roads near Columbus.

MICHIGAN — T-600 Grade-O-Matic Grader with sand tires on Route #12 near Battle Creek.

..with GALION Graders and Rollers

There's a mighty good reason why the name GALION is a familiar one on graders and rollers working on major construction projects across the country. That reason is their ability to help pull contractors out of tough situations caused by unexpected delays and rigid completion schedules.

GALION Graders and Rollers have the built-in stamina and reserve power to make up lost time by working at full capacity without let-up all day long. Their ease of handling and precision control enable operators to set performance records, get their job done on time and profitably.

FLORIDA—Galion T-500 Grader working on construction of Route #1.

CALIFORNIA—Galion Tandem Roller working on Dunsmuir project, Route #99.

WYOMING—Galion Roll-O-Matic Tandem Roller working on Highway #87 near Cheyenne.

TEXAS—T-700 Grade-O-Matic Grader working on Highway #75 near Huntsville.

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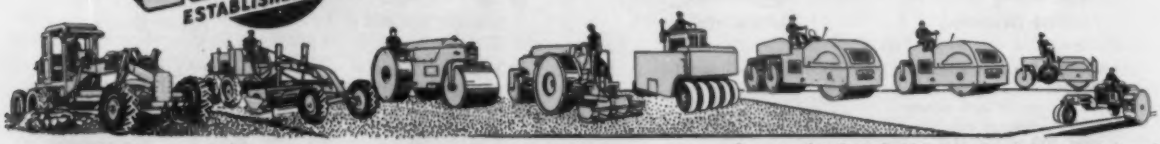

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MONROE, NORTH CAROLINA—Dickerson, Inc., used one of their Huber-Warco 8-12 ton tandem rollers on a recent paving project near Lumberton, N. C. Dickerson, Inc. presently owns 10 Huber-Warco rollers.

HUBER WARCO

HUBER-WARCO *tandem rollers*

3-5 ton 4-6 ton retractable 5-8 ton 8-10 ton 8-12 ton 10-14 ton

DRIVE FEATURES — Water-cooled torque converter cushions against shock. Tailshaft governor maintains desired speed regardless of grade for easy, accurate control. Two-speed transmission* prevents loss of efficiency in tailshaft governor or hydraulic steering at all rolling speeds.

KING OF KINGPINS — Complete freedom from kingpin and swivel pin looseness. Tapered roller bearings permit "like-new" adjustment. No road scuff in reversing. Kingpin and housing easily removable.

CONTROL FEATURES — Variable hydraulic control adjusts to steering "feel" best for operator. Dual controls. Parking brake system completely independent.

PERFORMANCE PLUS — Work within less than 2 inches of buildings. Unsurpassed visibility. Final drive mounted in the frame, not on it, for longer shaft, gear and bearing life.

*Except for 3-5 ton and 4-6 ton models.

A trusted product name backed by respected distributor names from coast to coast

MOTOR GRADERS

Standard transmission models from 83 to 160 H.P. Torque converter and power shift transmission models from 102 to 195 H.P.

TANDEM ROLLERS

3-5 Ton • 4-6 Ton Retractable • 5-8 Ton • 8-10 Ton • 8-12 Ton • 10-14 Ton

3-WHEEL ROLLERS

10-Ton • 12-Ton • 14-Ton Standard Weight 10-12 Ton • 12-14 Ton Variable Weight

MAINTAINER

M-52 — 45½ H.P. Attachments are Lift-Loader, Broom, Bulldozer, Patch Roller, Scarifier, Snow Plow, Berm Leveler

HUBER-WARCO COMPANY Marion, Ohio, U.S.A.

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PENN TURNPIKE CULVERTS

Continued from page 100

Structurally, nearly all of the corrugated metal culverts were found in very good condition. The larger ones had been shop-strutted (ellipsed at the factory) with horizontal wire struts. Most of them retain their elliptical shape, only one was found with a deflection of approximately 5 per cent but this deflection is not progressive and therefore is no cause for concern.

Material Condition. The corrugated metal pipes were the product of four different manufacturers. All were bituminous coated and paved but by different methods. Two brands were paved with preformed smooth pads, with the under side corrugated to match the metal corrugations. In one brand, large chunks of asphalt were missing and the pads showed severe cracking.

In the second brand, the pipes had been improperly assembled in the field, with the pad pavements on the sides or top rather than in the bottom of the pipe. In only one section of pipe was the pavement in the bottom. Large chunks of pavement were missing from these improperly installed pipes.

The third brand of metal pipe was fabricated with a thin perforated galvanized metal liner riveted to the inside corrugations. Then a bituminous pavement was poured until of the proper thickness over the liner. The pavements in these pipes were practicaly all gone, and with the exception of two, the liners were rusted out completely. This type of manufacture has long since been discontinued. The bituminous coatings in these culverts are brittle and flake off readily.

Pipes in the fourth and largest group were generally in good condition, so far as the invert pavements are concerned. Some surface checking was visible, especially at the ends exposed to the sunlight, but this checking did not extend through to the metal. Only where thickness of the pavements greatly exceeded the minimum recommended ⅛-in. over the crests of the corrugations, was severe cracking a factor and chunks of pavement missing at the ends of the pipe.

The bituminous coatings in this group of culverts were generaly in good condition. They showed practically no deterioration or drying out and some were still sticky to the touch. Several pipes were found installed too low and silting had taken place. In these cases the asphaltic coating was missing for 2 to 3 inches above the silt line, presumably due to freezing of the collected material.

Another minor problem was the rust-colored mineral deposit that built up at the wire strutting holes in the sides of the pipe. Temporary wires had been strung through these holes at the factory, to keep the pipe in elliptical shape during installation. Some cracking of the coating had taken place around these holes, as a result of freezing of water seeping into the pipes.

Practically all the culverts had concrete headwalls on one or both ends. Most of these were found in various stages of deterioration and two of them had failed. One of these had sheared on a horizontal plane at the midpoint of the pipe and top half had moved laterally a couple of feet. The other one sheared on a vertical plane and half of the wall had fallen into the stream.

The conclusion drawn from these inspections on the Pennsylvania Tunpike is that the corrugated metal pipes were performing well structurally under the normal to fairly severe loading and foundation conditions.

However, like any other construction, maintenance is required and this has varied from part to part. From a material standpoint, there is a wider range in anticipated durability. Some culverts were rated good for an estimated service life of 60 years or more without any maintenance. Others will require some form of lining or repaving to achieve equal durability. One point emphasized by the inspection is that careful methods of coating and paving, with the avoiding of excessive thicknesses, can result in lasting protection. Furthermore, careless installation can offset the normal durability built into the pipe by the manufacturer.

Policy on Waiver of Bid Mistakes

With a view towards reducing the difficulty in determining the successful bidder when an error in bid is alleged, Invitations for Bids for Corps of Engineers construction contracts will hereafter contain the following clause:

"Mistakes in Bids. The bidder hereby waives that portion of any alleged mistake or mistakes in his bid which falls within the following amounts:

If bid is $250,000 or less—5% of the bid;

If bid is more than $250,000 and less than $500,000—$12,500 plus 4% of the bid over $250,000;

If bid is $500,000 or more, and less than $1,000,000—$22,500 plus 3% of the bid over $500,000;

If bid is $1,000,000 or more—$37,500 plus 2% of bid over $1,000,000.

In cases where the allegation of mistakes exceeds the above waived amounts and the request for correction is allowed, such amount will be excluded from the contract price; however, the amount waived as provided herein will not be deducted for the purpose of evaluating bids to determine the low bidder.

The above waiver does not apply to any clerical mistake which is obvious or apparent on the face of the bid including but not limited to (1) mistake in the extension of a unit price or prices; (2) a mistake in totaling the sums of various bid items; (3) obviously misplaced decimal point; or (4) failure to insert the unit price where amount intended can be determined from face of bid.

This clause is not applicable to allegations of mistakes, which if allowed, would result in a reduction in the bid price."—*Associated General Contractors of Missouri.*

ARBA CONVENTION

Continued from page 69

More Private Engineering

The ARBA demand that engineering costs be isolated in state highway department accounting, to permit a fair comparison with prices obtainable from consultants, is part of a major move which several national organizations are engaging in to restore confidence in the merits of engineering by private firms. Consultants have been singled out for criticism by some federal agencies because so much of the location and design work in some states has been completed outside of state offices. ARBA consulting engineer members insist that they are up against a typical bureaucratic trend toward "empire-building," and that if all the costs of staff engineering are revealed, their services will appear very competitive.

The roadbuilder organization recommended to Congress that existing federal-aid legislation be clarified to permit private engineering to the fullest degree, the degree should be that found in the public interest, considering such factors as quality and cost of services, expedition of the work, and proper recognition of the American system of free enterprise.

The contract controls program initiated by the Bureau of Public Roads has been a thorn in the flesh of ARBA members since its origination. Unsatisfied by appeals that the highway program be held down to income flowing into the Highway Trust Fund, the association declared that this Administrative device has caused delays in the construction of vitally needed facilities, upset long-range programs in many states, and contributed to economic distress in the industry. The members asked that Congress enact legislation which will release millions of dollars of federal-aid funds currently tied up by the ban.

There has been persistent pressure from some sources in Washington, ARBA noted, to force the reduction of federal assistance from 90 percent of the cost of the Interstate System to something less, possibly 70 percent. This would be a mistake, the roadbuilders believe, considering the effort which state highway departments must make now to obtain matching money, the increasing burden of maintenance of completed Interstate roads, and the fact that the new federal gasoline taxes have made it difficult for the states to raise money from this source. Any change in the current ratio, ARBA maintains, would be a breach of faith by the federal government.

Actually, these expressions indicated the wide front on which ARBA must represent roadbuilders' interests in Washington this year, Executive Vice President Louis W. Prentiss said.

New Public Information Group

Considerable discussion at the convention was given to plans for the proposed Better Highways Information Committee, reported in detail in last month's *Washington Newsletter*. This was probably the most talked-about development at the Cincinnati convention.

One of the most popular sessions of the convention proved to be a "Congressmen Meet the Press" panel, in which a battery of construction press editors tossed questions at three Congressmen and drew some candid comments.

The editors wanted to know Congressional thinking on the Administration's proposed slowdown in construction of urban links to the Interstate System, contract controls and charges of over-design.

All three of the Congressmen declared they would oppose any elimination of adequate design features in Interstate Projects. All were agreed that there must be no minimizing of the urban projects. In response to a question by H. J. McKeever, editor-in-chief of *Roads and Streets*, the national legislators expressed a common opinion that the defense characteristics of the 41,000-mile Interstate net were not being adequately recognized, and that the Department of Defense should contribute something to offset the construction cost.

Congressman George Fallon, chairman of the House Subcommittee on Roads, asserted that the superhighways are "of greater importance than ever before" to the national defense effort. Their strategic role in providing rapid overland mobility for missiles cannot be minimized, he said. Senator Chavez, chairman of the Senate Public Works Committee, agreed.

"I firmly believe," he said, "that the Defense Department should pay its share of any construction cost that involves its needs."

(Last month the Department of Defense sought, and obtained, agreement from the Department of Commerce and the American Association of State Highway Officials to raise clearance of structures on the Interstate net from 14 ft. to 16 ft. It will cost an estimated $700 million to make the change in some completed bridges and to revise advanced engineering plans for others. The Congressmen were probably thinking of this development in their remarks to the ARBA convention. At any rate, a number of Congressmen are expected to press for some Department of Defense money to complete the System.)

Speaking at Cincinnati for state highway engineers, Alfred E. Johnson, executive secretary of the American Association of State Highway Officials, declared that the states are overhauling their administrative and engineering procedures from top to bottom. In the years just ahead, he predicted, some dramatic advancements will be realized.

Among the things the industry will see, he said, are the development of new materials for ice control, improved methods of communicating road conditions to highway users, new electronic devices for guiding and controlling traffic, new techniques for urban highway planning, and improved means of determining the economic effect of new highways.

Federal Highway Administrator Bertram D. Tallamy told the roadbuilders that the major problem facing the industry is that of rewinning public support for the National Highway Program.

"We must tell our story as we go along," said Tallamy. "Despite the efforts of the highway departments, the Bureau of Public Roads and the many organizations involved in 'better roads' movements, the general public is not well acquainted with what we are doing and why.

Continued on page 106

Cat DW21-PR21 units handle rock "on the double" on U. S. 10, Montana

When Albert Lalonde Company, Sydney, Montana, was awarded a $1,537,337 contract on a four-mile section of U. S. 10 on the Interstate System, three Cat DW21 Tractors with Athey PR21 Rear Dump Wagons were purchased for hauling the rock. A. M. Stolzenburg, Superintendent, tells why: "We ran three seasons with them in rock jobs. Now that we're back in rock again, we bought some more. They're big, rugged and an easy shovel target, have a low center of gravity and are maneuverable."

Note how these features met the conditions on this job. The units had to work in limited room on benches and steep haul roads. Material handled for fill included shot rock and sandstone. On haul lengths averaging 300 yards, the units handled 275 cu. yd. an hour. At the start of the job, they worked 8 hours a day; to finish it, 16 hours a day.

New DW21 Series G now 345 HP

Now the DW21 Series G is matched to the 22.5 cu. yd. PR21 for even faster production on the toughest jobs. Compared with the model it replaced, it has new HP—345 (maximum output) for an increase of 8%. It also has 12% higher rimpull. This increased rimpull provides up to 20% faster travel speeds under similar haul road conditions. Equally important, the horsepower increase was achieved without any sacrifice whatsoever in the excellent torque characteristics of the Cat Super-Turbo Engine.

Get the complete facts on the Cat DW21-PR21 from your Caterpillar Dealer. Ask for a demonstration. Pick a tough job—see for yourself how this giant handles the hard work!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

THE ONLY COMPLETE TRACTOR-TRAILER LINE... BY THE LEADERS

for more details circle 298 on enclosed return postal card

LOAD FAST! PR21 offers a big target. Short non-stop turns of DW21-PR21 unit speed spotting under shovel and work on a narrow bench. PR21's special steel withstands impact, abrasion and corrosion.

ROLL FAST! Two of three DW21-PR21 units on the job. DW21 combines high travel speed with excellent torque characteristics. The PR21 has a 22.5 cu. yd. heaped and 62,000 lb. capacity. All this adds up to fast cycles, top production.

DUMP FAST! PR21 has hydraulic hoists for quick and complete dumping of any material. DW21's hydraulic steering facilitates maneuvering. Wide-section, tubeless tires provide maximum flotation and sure traction.

ARBA CONVENTION

Continued from page 104

We must get the story across to the public if we are to win and hold the necessary public understanding and support."

Teer Again Heads ARBA

A nationally prominent contractor was re-elected president of the American Road Builders Association in Cincinnati last month.

Nello L. Teer, Jr., at 45, the youngest man to hold the highest office in the 57-year-old association, is president of the Nello L. Teer Company, Durham, North Carolina. The firm has completed 8,500 miles of highway for numerous agencies in the U. S. and abroad.

Two new vice presidents were elected:

Armand Keeley, president, Prismo Safety Corporation, Huntingdon, Pennsylvania; and George M. Foster, executive director, Indiana State Highway Department, Indianapolis.

Re-elected vice presidents are John P. Moss, president, Moss-Thornton Construction Company, Leeds, Alabama; and W. A. Bugge, director of highways, Washington Department of Highways.

J. N. Robertson, former District of Columbia highway director, was re-elected treasurer.

Directors named for 3-year terms are: E. B. Cape, president, E. B. Cape Co., Houston, Texas; Robert S. Holmes, highway construction representative, U. S. Steel Corp., Pittsburgh, Pa.; W. K. Cox, vice-president, Caterpillar Tractor Co., Peoria, Ill.; John C. Mackie, Michigan highway commissioner; H. L. Aitken, director, Department of Highways and Traffic, District of Columbia, Washington; Mason Butcher, director, Montgomery County Department of Public Works, Rockville, Md.; and George B. Hills, Reynolds, Smith and Hills, Jacksonville, Fla.

New Contractor Chairman

R. W. Hyde, president of Hyde Construction Company, Jackson, Mississippi, was elected president of ARBA's Contractors Division. Vice-presidents named are James E. Lambert, Lambert Construction Co., White River Junction, Vermont (re-elected); and Ralph Heffner, Heffner Construction, Celina, Ohio.

Nello L. Teer, Jr., reelected ARBA president—representing the type of industry leadership needed today to enable the contracting fraternity to do its share in highway program advancement. President of Nello L. Teer Company, Durham, North Carolina, a road-building firm which since its start by Teer's father in 1909 has built 2,600 miles of roads in U.S. and abroad.

Contractors Division directors 3-year terms are: William O. Faylor, Middlecreek Construction Co., Winfield, Pa.; J. M. Bratten, Ames and Webb, Inc., Norfolk; Stewart Watson, S. Watson Construction Co., Madison, Wis., John J. Curtin, Jr., Washintgon Contractors, Inc., Washington, D. C.; Walter Reed, Walter Reed Corp., Boston; W. E. Blain, W. E. Blain and Son, Mount Olive, Miss.; James Julian, James Julian, Inc., Elsmere, Del.; and Robert McDowell, McDowell and McDowell, Nashville, Tenn.

Directors-at-large, elected for one-year terms, are: John C. Ryan, John C. Ryan Construction Co., Phoenix, Ariz.; Sidney R. Johnston, Arlington, Va.; John P. Keeley, Keeley Construction Co., Clarksburg, W. Va.; H. C. Adams, Carey Construction Co. and H. C. Adams. Lexington, Ky., W. J. Troup, Jr., Troup Brothers, Inc., Miami, Fla.; Donald B. Stabler, Harrisburg, Pa.; and T. D. Lamb, Jr., General Contracting Co., Vidalia, Ga.

Other Division Officers Picked

George S. Richardson, partner in the Pittsburgh (Pa.) consulting firm of George S. Richardson & Associates, was elected president of ARBA's *Engineering Division.*

Levi Bird Duff of Pittsburgh, director of the Allegheny County Department of Works, was re-elected president of the *County and Local Roads Division.*

David H. Henderson, Washington representative, Armco Drainage & Metal Products Co., Inc., was re-elected to head the *Materials and Services Division.*

Emmett H. Karrer, professor of Highway Engineer, Ohio State University, re-elected to head the *Educational Division.*

Thomas K. Jordan, director of the Wisconsin State Aeronautics Commission to hear the *Municipal and Airport Division.*

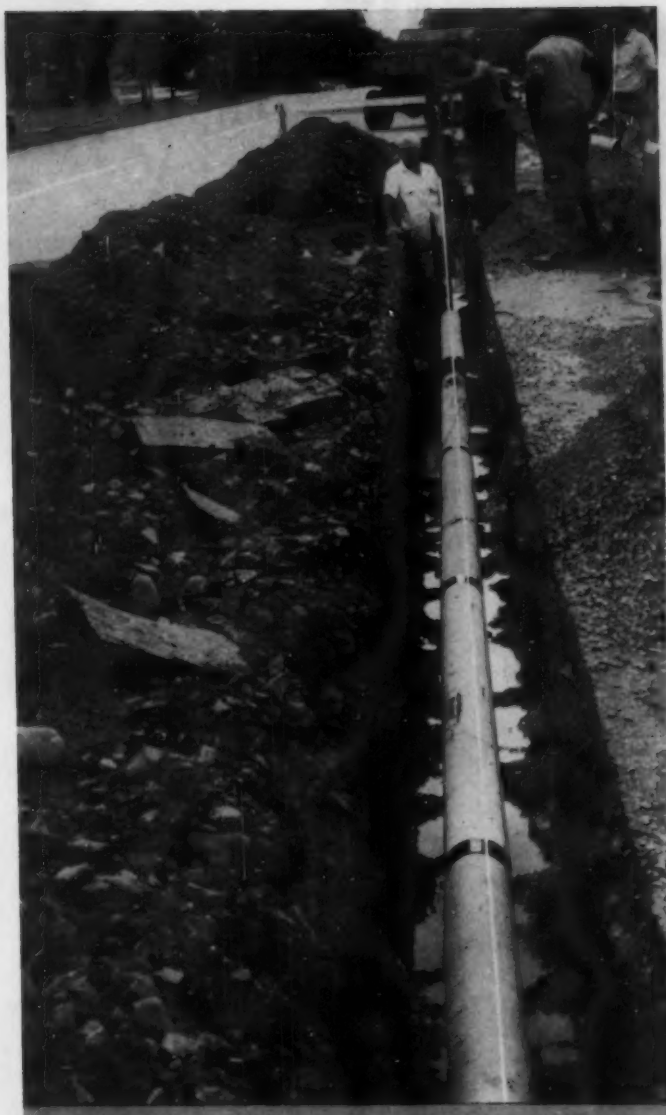
C. Cheever Hardwick, a partner in the New York investment firm of Smith, Barney & Co., heads the *Banking and Financing Division.*

Contractors are eager to help their supervisors and foremen better themselves through practical education, particularly short courses, ARBA's Education Division president, Emmett Karrer, told an ARBA convention audience. Said professor Karrer:

"An experience which we have had at the Ohio State University will indicate the tremendous interest in continued education that exists in the highway industry today. During the past three summers I have worked as a consultant with the Ohio Contractors Association, spending much of my time visiting with and especially listening to contractors. As a result of my experience during the summer of 1957, the conclusion was reached that a short course was needed for practicing highway contractors' supervisors.

"In the winter of 1958, we set up such a short course. In this course we covered such subjects as 'Supervision, What it is and How it Works.' 'The responsibility of the supervisor to the contractor and to the state.' 'Use of plans and specifications.' 'Construction surveying.' 'Applied engineering fundamentals dealing with problems of moisture and compaction of soils.' 'Problems of flexible pavement construction and problems of rigid pavement construction.' 'Management of construction equipment.' 'Safety,'

Continued on page 108



NEW!

for subsurface drainage...

TRANSITE UNDERDRAIN PIPE

- **Extremely good weight-strength ratio**
- **Naturally smooth interior**
- **Resists corrosion**
- **Assures low frictional resistance to flow**
- **Excellent alignment, tight joints, low material cost for new installation economies**

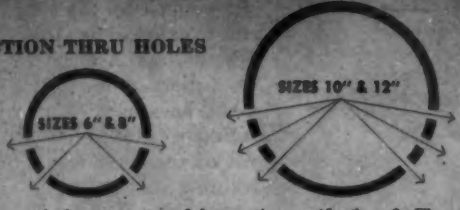
For highways, airports, dams, industrial plant sites—anywhere there's a subsurface drainage job to be done—Johns-Manville Transite® Underdrain Pipe does it effectively and economically.

The plastic coupling used with Transite Underdrain Pipe assures a permanently tight, *flexible* joint . . . keeps out waterborne silt and maintains permanent pipe alignment. And, because of Transite's long (10 ft. and 13 ft.) lengths, fewer joints are needed in the line.

Made of tough, durable asbestos and cement, Transite Underdrain Pipe won't rust. Its interior is made smooth to stay smooth, assisting the flow of water and reducing the opportunity for solids to find a resting place in the line. As a result, the perforations are able to perform their function of permitting entry of ground water into the line , at a maximum rate, where it can be quickly carried off.

Transite's low material cost, installation and maintenance economies mean important savings from the time it is specified until there is no longer a need for the line. Let us send you, without obligation, our book TR-246A. Write Johns-Manville, Box 14 (RS-3), New York 16, N. Y.

SECTION THRU HOLES



The minimum crushing strengths* of Transite Underdrain Pipe for subsurface drainage systems are shown in the following table:

PIPE SIZE (inches)	TOTAL APPLIED LOAD PER LINEAL FT. (pounds)	PIPE LENGTH (feet)
6	1,000	10
8	1,000	10
10	1,100	13
12	1,200	13

*A.S.T.M. 3-edge bearing method
A complete line of fittings is available including elbows, tees, wyes, crosses, end caps and increasers.

JOHNS-MANVILLE

. . . for more details circle 377 on enclosed return postal card

ARBA CONVENTION

Continued from page 106

'Labor regulations,' and most important of all, 'Employee and human relations.'

"For this course we set up a full week's schedule with a written examination each day. We lined up a staff of top-flight teachers, including some from industry, some from the State Highway Department and some from the University. Anticipating an attendance of 30 or 35, we came up with a budget which necessitated charging a registration fee of $60 per man. To my amazement, 57 applications came in for the Short Course. Knowing that we could not do justice to this many in one group, we accepted 40, repeated the school in March, and again had 40.

"The only criticism which we heard from the men who took the course was that we did not spend enough time on earthwork to suit the heavy grading contractors, we did not spend enough time on bridges to suit the bridge contractors, etc. In the winter of 1959 we repeated this basic school twice again, and in addition, set up a two-and-a-half day advanced short course for supervisors of bridge construction, and a similar advanced short course for supervisors of earthwork construction. A total of 230 practicing supervisors have attended this series of short courses.

"The surprising thing is that the contractors like the short course so well, that they asked us to repeat the basic course for the fifth time this winter and in addition, to set up a short course for top management on construction. The Ohio Equipment Distributors Association is asking for a short course for their management personnel. The Bituminous Industry is interested in a seminar. All of these requests for in-service training indicate the real desire of persons practicing in highways today for further education in their fields of specialization."

(A first-hand account of the Ohio short courses for contractor personnel appears in an upcoming issue.)

MIXING TIME for bituminous concrete is variously specified in 21 different combinations of wet and dry mixing time, among the 48 state highway departments, the range being over 100 percent.

NOW longer-lasting, high-p

EXCLUSIVE NEW V-6

Life expectancy: 3 times longer! Completely new design, more compact and stronger! Actual tests prove these advanced V-6 engines can give you up to 200,000 miles of continuous operation without a major overhaul.

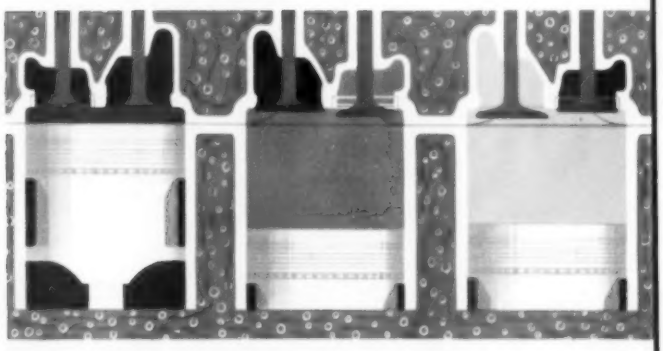
EXCLUSIVE NEW TWIN-SIX

Most power of any standard gas engine! Highest torque over a broader, lower, easy-stroking rpm range saves fuel, reduces engine wear and cuts shifting up to 60%.

Pistons are exclusively GMC designed and built for best sealing and longest life. Special casting with the head down assures more strength at the top where it's needed. 4-ring pistons have cast-in steel band to control expansion. All pistons are extra-heavy-duty design, yet every one is precision balanced to 1.8 grams for vibration-free performance, measured to .0003 inches for a perfect fit.

Massive, high-strength GMC connecting rods are drop forged, heat treated carbon steel. Every one is precisely balanced to less than 2 grams tolerance for smooth, lasting operation.

New, big-diameter GMC bearings last 7 times longer than others. M400 bearings will take the heaviest loads under the most extreme operating conditions.



Longer engine life with 33% more cooling area, 3 times more water volume than comparable engines! Notice the extra-wide water passages that completely surround each cylinder! See the widest spaced valves with the biggest cooling area for rapid heat dissipation! No two exhaust valves are adjacent! New high-volume water circulation (up to 176 gallons per minute) assures less than *4 degrees* temperature variation throughout. These are the most efficiently cooled engines with every feature to eliminate life-killing "hot spots".

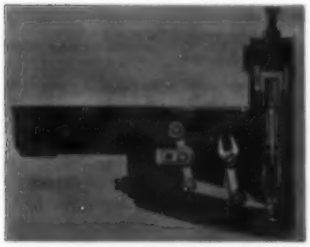
NEW GMC GAS ENGINES . . . PROFIT-PERFORMANCE ON EVERY HAUL		
Model	Gross Torque Range	Max. Horsepower
305A	258-260 @ 14-2200	150 @ 3600
305B	264-266 @ 11-2000	150 @ 3600
305C	268-270 @ 12-2100	165 @ 3800
351	308-312 @ 14-2400	180 @ 3400
401	375-377 @ 12-2000	205 @ 3200
[illegible]	[illegible]	[illegible]

erforming engines!

NEW V-6 DIESELS

Most power per dollar! New high-performance, fuel-saving GMC Truck diesels have proved, efficient 2-cycle design with power on every downstroke to give you more power per dollar, more power per pound, more power per cu. in. displacement.

New 6V-71 engines have all the proved performance, economy and durability features of the famous 71 Series, the power plants that are so well known in the construction business . . . in trucks and heavy-duty service equipment.



Only GMC Trucks have this economy range governor that positively controls engine speed in top gears at most efficient point for outstanding fuel economy.

Simplest, most practical and durable, and least expensive diesel fuel system of all! GMC's precision-built injector meters exactly the right amount of fuel to each cylinder, times the injection and atomizes the fuel for most efficient burning . . . eliminates troublesome high-pressure lines and complicated pumps.

- GMC Truck diesels have *four* exhaust valves per cylinder (not 1 or 2) for complete scavenging of all gases and freer breathing.
- Automatically save up to 5% fuel, get up to 7% extra hp. with the standard, exclusive hydraulic fan.
- Up to 530 pounds lighter than comparable horsepower diesel engines.
- Cut costly downtime and expense with complete one-stop parts and service at every GMC Diesel Truck Dealer.

POWER-MATCH YOUR JOB WITH NEW GMC DIESEL POWER		
Model	Max. Torque	Max. Horsepower
6V-71	577 @ 1200	189 @ 1800 or 210 @ 2100*

*No extra cost

See the Yellow Pages for your nearest GMC Dealer . . . for actual comparisons that prove GMC Truck superiority.

YOU CAN DRASTICALLY CUT YOUR HAULING COSTS

thanks to the BIG GMC BREAKTHROUGH in truck engineering

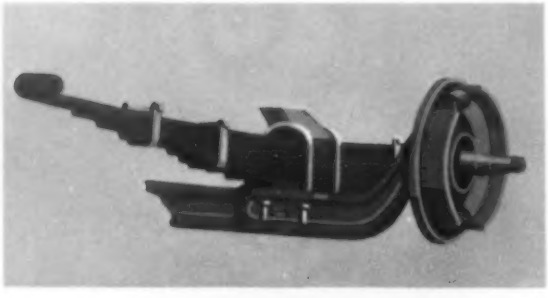
PULL

GMC
GENERAL MOTORS CORPORATION
TRUCKS

From ½-ton to 60-ton
General Motors leads the way!

Haul giant construction loads – up to 120,000 lbs. GCW – with this new BW9000 Series Conventional Ninety-Incher. New 702 cubic-inch Twin-Six with the most pulling power of all, plus maximum reduction of 124.46 will get your biggest loads moving and keep them rolling, anywhere. Easy-to-service 90" BBC "Cost-Busters" range from 19,500 lbs. GVW up.

NOW you can cut job time, cut costs with t



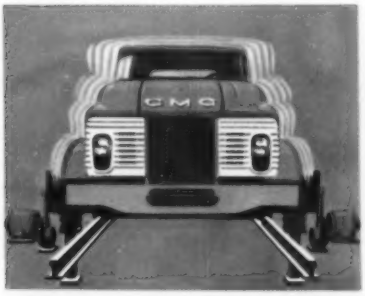
New, Stronger Front Suspension and Springs! New GMC heavy-duty models are easier to drive and last longer, too. You get increased stability, shorter turning and improved handling with longer-lived, wide-track I-beam front axles. New, longer, wide springs have more capacity, greater load-cradling flexibility.

Bigger Payloads, Less Maintenance! With this new GMC tandem suspension you have less unsprung weight, less truck weight for bonus payloads. Rubber mounts and bushings at all wear points practically eliminate service. True alignment of axles and equal load distribution at all times increase tire and axle life.

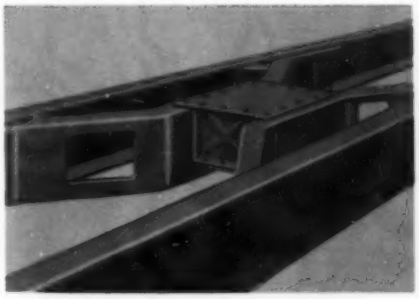
You can mount up to an 11-foot body on a 92-inch wheelbase, or practically *any* construction body on the new full line of GMC steel tilt-cabs. Turning circles are short as 33½ feet. Front vision is the best you can get. Payloads are bigger with front axle set back 52 inches. Full tilt of the 72" BBC cab cuts service time and costs. Choice of responsive V-6 and Twin-Six gas engines or new V-6 diesel.

Here is new, practical styling and uncompromising ruggedness...new GMC pickups with frames up to 100% stronger, V-6 power with 3 times longer life expectancy and stronger axles. There is extra stamina and extra value in every one of the 34 combinations, including "go anywhere" 4-wheel-drive models. Other 105" BBC Conventionals to 45,000 lbs. GCW. See them, drive them today.

the most advanced trucks in 20 years!



New GMC Double-Life Cabs! A man couldn't stand this "shake test" for 60 seconds, yet new GMC cabs can endure it for nearly two days . . . proof of superior construction and long life on every job.



Frames Up to 35% Stronger! Totally new design, new stronger and lighter materials make GMC Truck frames stand up under the constant tougher-than-normal construction hauling, permit you to carry bigger loads, too.

Longer Brake Life! You get cooler running, stronger and longer lasting brakes with GMC's new centrifuse drums . . . bigger lining areas give added lining life and quick, safe stops.

GMC Truck & Coach—a General Motors Division—Pontiac, Michigan

Ohio is in the lead in the number of miles of concrete paving jobs handled with centrally-mixed concrete. This plant seen on Interstate project near Painesville. Contractor: Horvitz Construction Company.

Where States Stand on Central and Transit Mix

Many departments still limit its use in highway paving, latest survey reveals.

Use of "non-paver" concrete paving methods increased in the state highway programs during the past two years—but the picture of acceptance remains extremely spotty.

This was the chief finding of a survey by the *Roads and Streets* editors, designed to update a review published in 1957. In some states, such as Ohio, a large and growing yardage of concrete for Interstate and other state highway paving has been placed in recent months using central or transit mix. But in the majority of states, rigid restrictions continue to prevail on such mixing and transport, and a "show me" attitude best describes the thinking of the state engineers.

There continues to be heavy use of both central mix and transit mix concrete for structures, for curbs and gutters, for widening strips and other auxiliary highway features such as acceleration and

Transit mix trucks supplying Limestone Pike relocation near Philadelphia, Pa. Contractor: James D. Morrissy, Inc., of Philadelphia. Slab built up in 7 in. and 3 in. lifts. Reinforcement consisted of 6x12- 0/4 (6/3/0) welded wire fabric, 73 lb. per 100 sq. ft., Pennsylvania Spec. Type F. Jaeger spreader plus a transverse finisher used.

deceleration lanes. But the *Roads and Streets* survey on the use of these techniques for paving of main traffic lanes showed only a moderate overall increase. A majority of states "permit" concrete paving on state highway projects by central or transit mix, yet when asked "is there a tendency by your department toward more recognition of centrally mixed concrete?"—the "no's" equalled the "yes's."

On paver-less operations use of transit mix concrete outdoes wet batch by 10 to 15 percent, according to the questionnaire. Yet the majority of complaints registered against the two methods were directed at control of transit mix concrete.

To meet the difficulties which the critics cite in both methods—such as control of mix—the highway departments employ a number of accessory devices and practices including automatic cement recorders and, in one case, a requirement that the batch be "transit-mixed" (i.e. mixed in the truck-mixer drum) entirely at the plant.

Most of the states gave an unqualified "yes" when asked if they permit paving on state highway projects by central or transit mix. A few allow only one of the two techniques and a number of others okay their use only under certain conditions or for limited objectives.

Kansas, for example, requires the obtaining of special permission; Rhode Island the same, adding "... under specific controls." Wisconsin limits these methods to single-lane construction and subject to sufficient production to assure reasonably continuous progress. Concrete paving construction in Hawaii is limited to acceleration and deceleration lanes but all of this is done by wet batch methods.

States in which "paver-less" paving is done usually favor one of the two methods almost to the exclusion of the other. Out of 25 states which submitted the percentage of their road paving done by "non-paver" methods, 23 said that they do more than 75 percent of such work by just one of the methods. Eight states use central mix entirely where the pavers aren't used, while seven go all the way with transit mix. Total usage, however, gave the edge to transit mix on a volume basis.

Among states which placed centrally mixed paving concrete during calendar 1959, mileage totals ranged from Ohio's 145 to a number of states with fractions of a mile. Percentage-wise, Delaware had the lead in 1959 with their 15 miles paved comprising 70 percent of state's total. States where central mix figured measurably in total paving concrete for state highways were Ohio, 30 percent; New Mexico, 23; North Dakota, 20; New Jersey, 15.5; and Nebraska, 14.

States *not* permitting paving with central or transit mix concrete were asked what they considered the chief obstacles or problems in acceptance of these methods. The answers most frequently given:

Difficulty in controlling uniformity.

Unsatisfactory methods of placement.

Rate of delivery at the job.

Control of slump.

Segregation in the mix.

Where non-paver methods were used, the same difficulties were mentioned, and a few states brought in other considerations such as problems in uniform control of water and/or air entrainment; and particular problems of delivery and discharge during summer months.

Following are comments from a few highway department representatives on the use of transit mix and central mix concrete today:

Ohio. To combat segregation, it is considered desirable that chute lengths be kept to a minimum and the concrete distributed across the grade with an approved spreader. This latter is especially important

with 24-ft. width construction. Three types of spreaders now in use and performing satisfactorily are the screw, paddle and hopper type, with the latter designed primarily for receiving transit or central mix concrete.

Minnesota. This state reports experience with inconsistent cement quantities in batches; therefore now requires automatic cement recorders "as an added precaution." These are intended to present a visual record of what has happened concerning cement quantities in each batch.

Missouri. Transit mixers are required to mix the material *at the plant* under the supervision of the plant inspector. The mix is then transported to the job site with the drum operating at agitating speed, thus providing, according to the department, a better control over mixing time.

Delaware. This state, which does considerable central mix paving with satisfactory results, stresses control of mixing and delivery during the warmer months. It increases control by stricter personal surveillance, more air and slump tests, and rigid control of water by strict coordination between the field and the plant inspector.

Interstate Fund Split in Nebraska

More than local interest is seen in a method recommended by the Nebraska State Highway Advisory Commission for dividing interstate highway funds between rural and urban portions of the state.

With certain qualifications, the plan allocates 77 percent of the State's "I" funds to rural and 23 percent to urban projects. Governor Brooks said in approving the split he interprets the qualifications as meaning the split is "only a goal to be sought. It is not to be construed," he added, "as a barrier to effective programming and the development of a maximum number of usable highway segments in the state."

The governor noted that the commission had recognized that "particularly within the next two years, more elasticity in the application of the formula may be required than in later years." He said the division of funds "closely approximates" the construction previously planned and projected by the State Department of Roads for the next four years.

Acting State Engineer John Hossack said less than 3 percent of the funds placed under project agreement with the Bureau of Public Roads to date in the Nebraska interstate program had been for urban work.

Where States Stand on Paving Concrete

State Highway Department replies to question: "Do you permit concrete paving on state highway projects to be done by central or transit mix concrete?"

	Yes	No	Under Certain Conditions	Only Central Mix	Only Transit Mix
Alabama			X		
Alaska		X			
Arizona					
Arkansas	X				
California	X				
Colorado	X				
Connecticut		X			
Delaware				X	
Florida	X				
Georgia		X			
Hawaii			X		
Idaho	X				
Illinois	X				
Indiana	X				
Iowa	X				
Kansas			X		
Kentucky			X		
Louisiana	X				
Maine	X				
Maryland		X			
Massachusetts					
Michigan	X				
Minnesota	X				
Mississippi					
Missouri			X		
Montana	X				
Nebraska	X				
Nevada	X				
New Hampshire	X				
New Jersey			X		
New Mexico	X				
New York			X		
North Carolina			X		
North Dakota				X	
Ohio	X				
Oklahoma			X		
Oregon					X
Pennsylvania					X
Rhode Island			X		
South Carolina	X				
South Dakota	X				
Tennessee	X				
Texas	X				
Utah	X				
Vermont		X			
Virginia		X			
Washington		X			
West Virginia	X				
Wisconsin	X				
Wyoming	X				
District of Columbia	X				

Which Wheel-Type Loader for You?

Dumping reach and superior machine balance are features of the new Cat. No. 944 wheel Traxcavator. Here, a test machine holds a load at full lift height of (12 feet) while moving to dump into a transporting vehicle.

With the continuing upward spiral of the costs of doing business, certain information recently developed by Caterpillar Tractor Co. on the factors determining wheel-loader productivity is timely food for thought.

As with other capital goods, wheel-loaders should be purchased for their ability to produce a certain amount of work at a fairly predictable cost. To do this, selection of the most productive wheel-loader for a particular job should be based on analysis of (1) production required, (2) productive ability of each loader under consideration, (3) purchase price in relation to machine quality, and (4) other factors such as parts and service availability and approximate trade-in value of the unit purchased.

Production requirements usually are known or can be figured with little trouble. Plotted on graphs in terms of yards, tons, cords or number of trucks per hour or per day, owners can chart the necessary production on an average daily, peak daily, average hourly and peak hourly basis.

Finding the wheel-loader best matching the work load is often more difficult, according to Caterpillar Tractor Co. studies. Loader specifications give a "manufacturer's eye view" and can be of some help in determining capacity of each machine on various operations. However, as suggested by Table 1, the 12 major domestic manufacturers of loaders have substantially different rating practices. Prospective machine buyers generally have even greater differences in interpreting these ratings. Bid specifications and equipment specification sheets are written in the same terms, but each organization has a different definition for many rating conditions.

A machine purchased in these circumstances may be too big and expensive, or too light and unproductive. Buying a 3-yd. loader because 12-yd. trucks are loaded is seldom economical if the loader is idle 60 percent of the time. Difference in loading time between a 2-yd. and a 3-yd. loader serving a 12-yd. truck is about 60 seconds, or less than the usual delay at a traffic light or the scale house.

Important specifications in se-

Continued on page 118

"Very fast on the haul"

Glenn Lowder, *foreman*

These experienced earthmoving men like to talk about their new LW Speedpull ... *and there's a good reason for their enthusiasm.* The J. M. Sumsion & Sons firm put two of these 276-hp, 20-yd heaped-capacity units to work on one of its recent contracts ... rebuilding 5 miles of U.S. 160, north of Monticello, Utah ... and the production job turned in by the 37.7-mph Speedpulls was *remarkable.*

Working in ripped sandstone ... material weighing up to 2,730 lbs per yard ... the Speedpulls picked up good 14-yard payloads in an average of one minute. Cycles a mile long were completed in about 4 minutes. Together, the two units averaged 335 yards per 50-minute hour.

Fast, level ride and a lot more

You'll be hearing much about the LW six-wheel Speedpull in the future! Fully proven as a BIG producer, its advanced features include:

HYDRAIR* SUSPENSION: absorbs all shocks, levels the ride for faster, safer hauls; eliminates need for front axle, prevents troublesome axle "dozing" action ... HIGH POWER-TO-WEIGHT RATIO: only 336.9 pounds of total loaded weight per horsepower, best in its class ... FULLPAK® SCRAPER: lower, wider for better boil, fewer voids, bigger payloads ... POWER-TRANSFER DIFFERENTIAL: lets 'Pulls* operate in soft going that stops other scrapers ... ELECTRIC CONTROLS: instant-response, pinpoint accuracy control, easy-to-operate, easy-to-maintain ... and BIGGEST BRAKES IN THE INDUSTRY: 3,764 square inches of brake surface for more safety.

Ask for complete information on the new LeTourneau-Westinghouse C Speedpull. See how this fast 20-yd scraper can help cut costs on your long-haul jobs.

One of two LW Speedpulls owned by J. M. Sumsion & Sons, Springfield, Utah, gets big payload of ripped sandstone. These 20-yd six-wheel earthmovers, together with two 16-yd C Tournapulls®, moved 136,000 yd of sand and sandstone to widen U.S. Highway 160 to 33 ft, and reduce grades to a 4% maximum. *(Note: if you anticipate long hauls in your future work, investigate LW Speedpulls now ... for lower net-cost earthmoving.)*

*Trademark CSP-2181-DCJ-1

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

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WHEEL-TYPE LOADER

Continued from page 116

lecting a wheel-loader are:

(1) Loader components (bucket capacity, lifting capacity, bucket operating speed), and chassis components (engine power rating, physical size and weight, work and travel speeds).

Each detail affects the others in determining total productivity, durability and cost of owning a particular wheel loader.

Most manufacturers rate bucket capacity by Society of Automotive Engineers recommended practices. This heaped rating is a good measure of the "average" amount of material put in the bucket for the "average" materials by reasonably competent operators.

Lifting capacity describes a machine's ability to pick up its load. It is a scientific measure of machine limitation and is normally expressed as a curve of capacity at various bucket heights such as in the Figure (Table 2).

Carrying capacity is a popular rating, apparently describing the work-load possibilities of a machine. Unfortunately, the Caterpillar studies point up the fact that the term has no real meaning, because it implies machine stability and operator safety while carrying a certain load. A designer cannot establish such a rating that will be valid on every job. Only an experienced operator, working a specific job, can establish his carrying capacity by the feel of the machine.

Bucket operating speeds are important because sluggishness or under-capacity limits total machine productivity. Loader geometry is important to production, too, and

Continued on page 134

Table 2

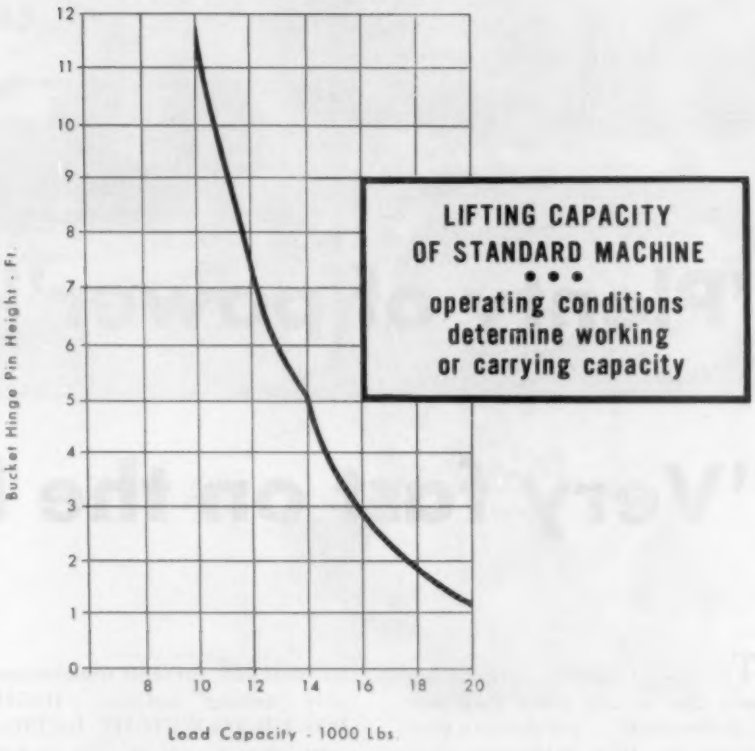

Table 1

Comparative Loader Specifications

Wheel-Type, 2 to 2½-Yard Size Class

Machine	Std. Bucket Size	Max. HP Rating	Weight lb.	Approximate Factory Price Diesel	Gas
A	2½	130	23,300	$23,375	.....
B	2¼	122	22,300	21,750	$19,200
C	2½	120	21,500	20,965	.....
D	2	135	20,780	20,350	17,950
E	2¼	105	20,310	20,270	18,450
F	2	133	20,700	19,600	16,250
G	2	105	17,891	19,250	16,600
H	2	104	17,600	18,850	16,500
I	2	105	18,300	18,725	16,300
J	2	100	18,432	18,622	.....

Bucket Reach and Heights Compared

Table 3

Reach at 7 ft. Dump Height

Machine	
A	Not available
B	32"
C	Not available
D	50¾"
E	49¼"
F	34½"
G	41"
H	Not available
I	42"
J	51"

Table 4

Dumping Height Measured to Bucket Hinge Pin

Machine	
A	11' 10"
B	10' 4"
C	Not available
D	11' 11¾"
E	11' 7½"
F	10' 2"
G	11' 3"
H	11' 6"
I	10' 11"
J	Not available

Table 5

Dumping Height, Measured to Dumped Bucket Edge

Machine	
A	9'
B	8' 3"
C	Not available
D	9' 1½"
E	8' 10"
F	8' 4"
G	9'
H	9'
I	9'
J	8' 6"

Cut costs with Tournatractor®...it puts in

More profit-time... reduces waste-time

If you want to determine, for your *own* satisfaction, the advantages of owning a big LeTourneau-Westinghouse Tournatractor, do some stop-watch-timing of any of the tractors you *now* own.

You'll find, if the job you're working is spread out in any way, that a tractor spends a *lot* of time doing nothing more than *going to* and *coming from* the actual *productive* jobs it's handling for you. And travel time earns you *nothing*. It's only high-cost "overhead".

Now figure travel time at 17 mph

With Tournatractor, you cut that item of overhead by more than half. That's because, on job-to-job travel, Tournatractor moves more than twice as fast as the fastest crawler tractor. It *runs* between assignments . . . at speeds to 17 mph! You get more work done per day, and very often you can get by with one less tractor in your fleet.

Fast...and a hard worker

Because Tournatractor *is* fast, don't get the idea it's just a "hit-and-run" flyweight. Not on your life! It's got the sock and ruggedness of a true "heavy". With 218 hp and up to 15 tons of work-weight, it can match muscles with any tractor its size. On most of your jobs . . . in fact, on work done at 2 mph or over . . . it *betters* the "pounds-pull" offered by crawler-tractors that cost more money and accomplish less work.

Contractors today are using Tournatractor on all types of tractor work, from dozing to push-loading, to clean-up assignments. And it can pull and operate a wide range of work attachments. You'll often see Tournatractor pulling big scrapers, water tanks, and compactors. Fact is, it's a "natural" for compacting, because when those big tires are hydroflated, Tournatractor adds a "bonus" compaction factor of 20 tons.

Let us show you how Tournatractor can fit into *your* operations. Let us help you analyze your tractor costs and show you specifically how this fast, mobile machine can pay you big dividends in a hurry.

A few quick facts about the LW Tournatractor . . . RIMPULL as good or better than comparably-sized crawlers, at all speeds over 2 mph . . . ROADABILITY anywhere, with no damage to concrete, blacktop, planking, or rail ties . . . TORQUE-CONVERTER TRANSMISSION with non-stop shift . . . EASY OPERATION with fingertip-switch electric control of dozer blade and other attachments . . . 218 horsepower, 15 tons of working weight.

CT-2111-DC-1

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

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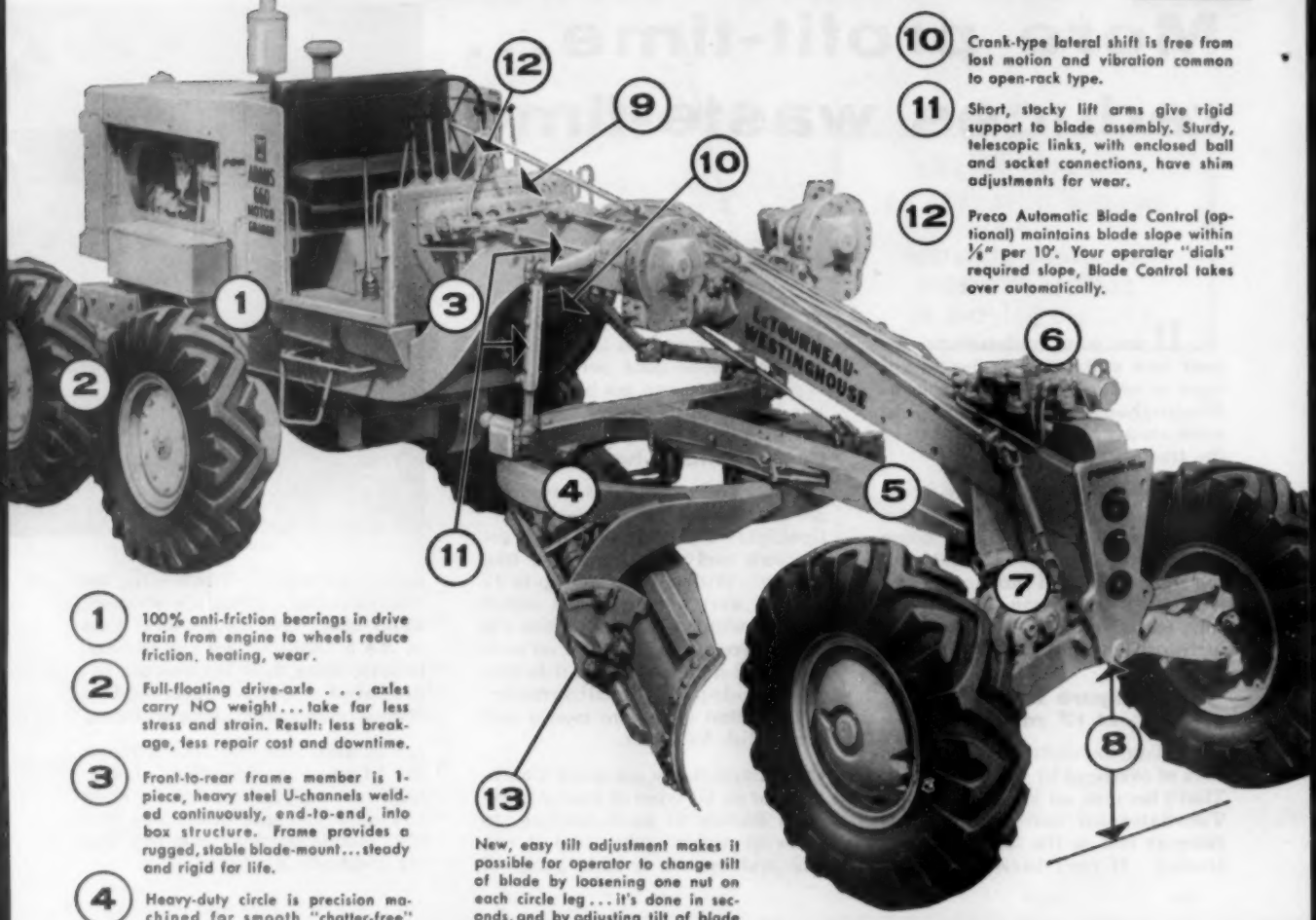
COMPARE LW



1 100% anti-friction bearings in drive train from engine to wheels reduce friction, heating, wear.

2 Full-floating drive-axle . . . axles carry NO weight . . . take far less stress and strain. Result: less breakage, less repair cost and downtime.

3 Front-to-rear frame member is 1-piece, heavy steel U-channels welded continuously, end-to-end, into box structure. Frame provides a rugged, stable blade-mount . . . steady and rigid for life.

4 Heavy-duty circle is precision machined for smooth "chatter-free" operation. The *big* 63"-diameter circle assures accurate control of cut.

5 Strong T-shaped drawbar gives firm circle support . . . for accurate blading in all positions.

6 With power steering, operator exerts only slight pressure on steering wheel, and hydraulic power does the work. Yet, "road feel" is retained. Power-steering system has its own hydraulic pump.

7 Gear-driven leaning-wheel mechanism is enclosed to give protection against dirt. Wheels hold set position . . . require no safety lock-pin for high-travel-speeds, or when using front-end attachments.

8 You have up to 28" front-axle clearance, depending on tire size. This prevents axle from bulldozing high windrows, lets grader come up out of deep ditch-cuts without front-axle dragging the shoulders.

9 Blade controls operate through three-jaw clutches that mate without shock or kick-back. Joint-free construction of power box eliminates oil leakage on cab floor.

10 Crank-type lateral shift is free from lost motion and vibration common to open-rack type.

11 Short, stocky lift arms give rigid support to blade assembly. Sturdy, telescopic links, with enclosed ball and socket connections, have shim adjustments for wear.

12 Preco Automatic Blade Control (optional) maintains blade slope within 1/8" per 10'. Your operator "dials" required slope, Blade Control takes over automatically.

13 New, easy tilt adjustment makes it possible for operator to change tilt of blade by loosening one nut on each circle leg . . . it's done in seconds, and by adjusting tilt of blade for light or heavy grading, operator does more and better work.

Efficient LW grader attachments include: Ateco ripper, scarifier, bulldozer, push-plate, Jebco Elegrader and Jebloader, V-type snow plow, and standard or rotary-type snow wing.

advantages with any other grader

...you'll be convinced they give you more for your money!

Best way to judge a grader is to compare it . . . against any machine in its class. Do this with LeTourneau-Westinghouse graders; you'll find they give you *more money-saving, more profit-boosting features than any other grader on the market.* Others may offer *some* of these advantages, but you get all of them in LW graders.

Compare transmissions:

Other graders offer transmissions with 6 to 10 speeds; LW graders have 15 . . . 8 forward, 4 reverse, and 3 optional creepers. With *more* full-power gear-ratios you can handle most grading jobs at higher speed. Result: you can do up to 28% more blade work. LW's faster *back-up* speeds save time on shuttle-type work. In addition, you save time getting to and from a job, because top *travel* speeds on LW graders are up to 5 mph faster than on most other graders. On LW POWER-*Flow*® models you get *infinite* speed ranges, with torque-converter transmissions *automatically* matching speed and power to any load.

Compare engines:

You choose from either General Motors or Cummins power plants for your LW graders, to standardize your fleet, lower your parts inventory and service costs. No matter which engine you choose, it is *mounted on rubber,* to reduce vibration, increase operator comfort.

Compare construction:

LW's one-piece box frame is *continuous welded, end to end.* LW rear axles *carry no weight;* they "float" on anti-friction bearings to transfer *full* power to drive-wheels. High-arch, front axle is *welded bar-and-plate* for long life. ALL gears and shafts run on anti-friction bearings. And the big 63" blade-circle is precision-machined . . . top, bottom, and inside. Compare *these* strength features to those of ANY other grader.

Compare operation:

LW controls are grouped for "natural" hand-motions to get fastest blade positioning. All average blade positions can be obtained from the cab. Blade movement is *fast* . . . you can switch from high bank-cut to deep ditch-cut in less than a minute! Positive-acting hydraulic brakes operate at light touch of convenient pedal. What's more, on LW graders, your operator has clear view ahead, *and* can see both ends of the blade . . . where visibility is most important. He has this visibility *whether he's sitting or standing!*

Check the features illustrated here, then take the next step . . . ask us to *show* you an LW grader in the size you need. Seven models from 67 hp to 190 hp. We'll arrange for a demonstration at your convenience . . . with your operator at the controls. A phone call or a short note is all it takes!

*Trademark G-2106-G-2

LW

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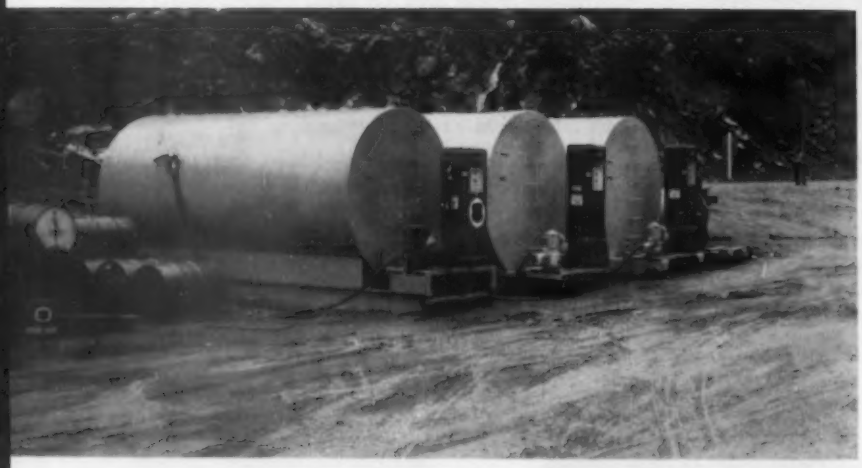
Where Should Fuel Storage Tanks Go?

Continued from page 68

"Upstairs" for Gravity Flow?

Gravity set-up for a California road job. This 10,000-gal. tank with Brodie fuel meter rests on a shelf above the equipment yard of Guy F. Atkinson Co., as seen on firm's US 99 relocation job.



Set Tanks on the Ground?

Diesel tanks on skids, each complete with dispensing pumps, were stationed centrally on Colorado canyon road job. H-E Lowdermilk, contractor.

Or Should Tanks be Buried?

An example of underground tank installation with dispensing pumps for diesel fuel alongside a contractor's field shop. Yonkers Contracting Corporation, on then US 22 relocation in New Jersey.

at least gasoline, the contractor must become familiar with the safety laws and regulations that apply to the project area. Your job insurance may specify compliance with such laws, for one thing.

In built-up areas you are hedged in with such regulations, which is why many contractors eliminate all job storage and rehandling of fuels on urban work and require their supplier to refuel job equipment directly from delivery tankers.

Gasoline particularly must be stored underground in many instances, and only in tanks Underwriter labeled for underground service. Gasoline pumps and dispensing facilities must also meet rigid safety requirements. Explosion proof electric motors are a "must" for fuel pumps. Tanks, pumps and hose should be electrically grounded as protection from static electricity sparks.

Where only a small amount of gasoline is to be used, it should be stored in 5-gal. safety cans with adequate fire protection.

Gasoline should never be used for cleaning of quipment parts.

Leaded gasoline, reminds a Standard Oil Company (Indiana) handbook, requires special care in handling; workers must be guarded against the injurious fumes and against spillage on hands or clothing.

Gasoline storage and handling should be kept several hundred feet from any trenching or pit work. Gasoline vapors creep along low ground and vapor accumulations can cause explosions.

The best answer: gasoline storage on the job should be limited as much as is feasible, and most gasoline handled only once, from transport to the contractor's fuel truck.

Storage Tanks

When your job does require storage tanks, the first decision is what size, how many and where to locate them. If you put them underground, they can be safely located for the most convenience, such as alongside the entry or exit path at the field shop or yard.

The size of diesel tanks will often depend on the cost of moving them—any tank larger than 5,000 gal. begins to be a major transport problem; also an excavating problem if put in the ground. For diesel fuel, size is a matter of economics, but for gasoline storage, large tanks in the 2,000 gal. and up sizes represent a serious explosion hazard.

When should storage tanks be put "upstairs"—on a convenient hillside, steel or timber tower, or earth mound? For example, in a case where a 1,000-gal. or larger tank is put on a hillside with hoses or pipes stretched a considerable distance downhill to handle gasoline, a very sizable explosion hazard may exist. On the other hand, smaller tanks such as 300 or 500 gal. storage units on steel towers have proven to be quite safe over the years. It would appear that the general subject of gravity feed simply requires the use of good common sense.

Storage tanks as large as 6,000 gal. for diesel fuel, mounted on skids or a rubber-tired trailer chassis, have been seen on some outlying road jobs. A southern contractor who graded 10 miles of Interstate road, serviced his 12 scrapers, plus dozers and motor graders from a 6,000 gal. skid tank. The tank carried a warning sign: "Don't try to move unless empty!" A heavy tractor towed the tank along the prairie terrain whenever the scrapers opened up a new work area. This scheme undoubtedly worked well for this contractor.

A job storage setup for diesel fuel in Illinois has attracted interest. Several 4,000 to 7,200 gal. semi-trailer highway tankers that have seen their best service were brought up by one large contractor and refitted as mobile job storage tanks for rural highway projects. Each carried a gasoline driven pump with meter. For each job, one or more of the tankers was spotted as a bulk storage station along an access road near the contractor's field office. He thus took the full advantage of the economy of direct refinery shipment.

This idea is recommended by one observer as one that will pay for itself quickly on a larger job, or with a contractor who handles a large volume of highway jobs in rural areas. Using one of these mobile bulk stations as a "sow," the contractor can then rig up a 1,500 gal. tank, with compartments, mount it on an old truck, and work out twice a day to catch equipment. This contractor has his scrapers and earth wagons pull up directly to the mother tanker working near, at minimize the gallonage rehandled. The trucks catch the equipment farther out.

Secondary Tanks

How should fuel be dispensed through the job? Here is where careful planning may pay off best. For a steep, rocky terrain, it may be necessary for the advance tractors to drag 250 gal. or smaller skid-mounted tanks up and down trail. A drill rig and compressor on a new ledge may need the supply tank skidded down into a ravine each day or two, where an all-wheel-drive tank truck can get in to make a refill.

As the haul and access roads are opened up, the answer on a recent Tennessee Interstate job was to spot five or six 500 gal. tanks along the haul paths and access roads. Tanks were moved often with little effort, and by careful spotting were kept near the equipment. Also fuel was rehandled from delivery tanker into 250-gal. tanks mounted on all-wheel-drive trucks, as a supplementary means for keeping equipment refueled.

Better Tanks

Welded tanks have recently been given much design attention by manufacturers. Today some of the oil companies, working closely with these fabricators, are urging the contractors to get away from skid mountings. Skid tanks, being low off the ground, are often damaged by passing equipment, and still oftener they are wrenched and made leaky by rough dragging over rocks and snags.

Frame-mounted tanks have several advantages, these suppliers point out. They keep fuel up off

A combination of small tanks spotted through the job and tanks carried on all-wheel-drive trucks—as used by Haynes Construction Co. during pioneering phase on a Tennessee hill-country road job.

the ground, where it is cleaner. Dispensing is easier. Gravity feed is no serious hazard considering the small storage. The tank and its mounting can easily be picked up and moved by a truck crane or cherry-picker.

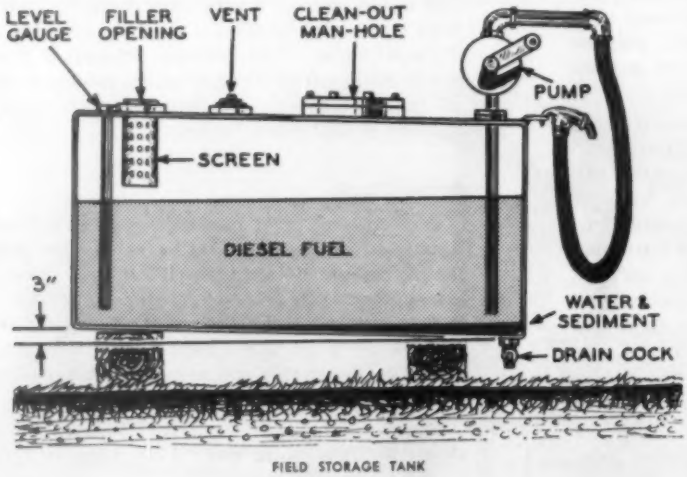
Frame-mounted tanks are available out of the supplier's catalog today in sizes from 150 to 600 gal., complete with the best type of pump and connections, and with empty weight and other useful data specified. Stilt-mounted tanks are recommended by one refinery man as a "good place for the contractor to invest his money for better job efficiency."

The Right Job Carrier

Contractors today are giving more thought to the kind of trucks best suited for transport of fuel through the job. One example is an Illinois contractor, who devised a 500-gal. towed unit on rubber tires. The chassis came from a discarded farm tractor, with tongue added for towing. The tank with pump on top refuels earthmovers, freeing the contractor's truck for other work except when the trailer needs to be moved. Four of these trailer-tanks have been made up, three carrying hand pumps on top and one fitted with a gasoline driven pump for boosting diesel fuel up into some of the larger rigs.

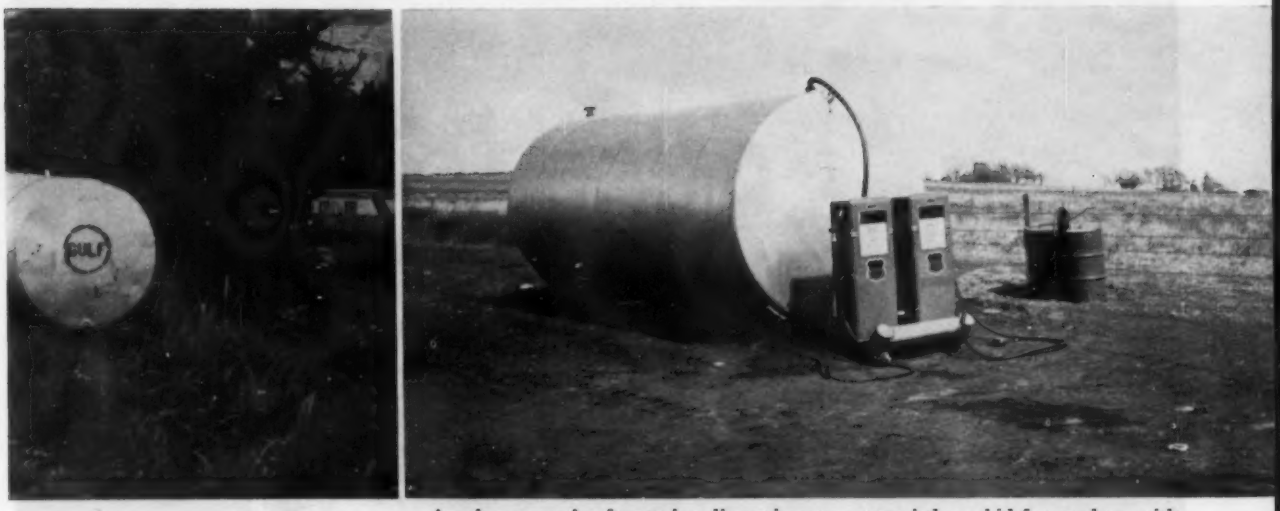
Pumps and Valves

Here is a "big little" element of the planning. There is a trend toward faster pumps, with 30 gal.



FIELD STORAGE TANK

Familar scheme for storage of diesel fuel, as sketched by LeTourneau-Westinghouse.



Another example of metering dispensing pumps carried on skid frame along with a job storage tank—Stafford Construction Co., Lubbock, Texas.

per minute metered pumps used now on many projects to save time and help with the bookkeeping. Manufacturers offer a wide variety of equipment, and their advice can help the contractor's profit. One of the most interesting developments is an electric pump, good for either gasoline or diesel, which can be mounted on a tank and plugged into the nearest power socket.

Metering of course doesn't need to meet Bureau of Standards requirements for accuracy, since less accurate measuring suffices for cost accounting and keeping track of the job supply.

Even fuel barrels on some jobs are being pumped out at high speed today. The contractor is advised to get a half dozen high speed rotary pumps if a considerable supply of barreled fuel must be handled.

Keep Fuel Clean!

There is a right way to store and handle fuel to prevent contamination and thus eliminate the combustion troubles and possibly job stoppages that will follow.

The big enemy is condensation—forming of moisture on the inside of the tank above the fuel level. LeTourneau-Westinghouse advice on this detail:

With 55 gal. barrels, be sure barrel is completely full. Tanks on the equipment should be filled at the end of each day or shift, while the tank is warm from the engine heat. Condensation is mostly likely to occur as the tank cools after work shutdown.

Danger of contamination incidentally is one reason for keeping rehandling to a minimum.

Continued on page 132

Fuel Consumption

As reported by an Indiana Road Contractor

Scraper, Euclid TS-24	20 gal/hr.
Scraper, Caterpillar DW 21	12 " "
Scraper, Euclid 5-7	6 " "
Tractor, Cat D8	10 " "
Tractor, Cat D6	6 " "
Crane, Koehring 605 (1½ C.Y)	7 " "
Crane, Koehring 405 (1 C.Y)	5 " "
Grader, Cat 12	6 " "
Roller 12-Ton	4 " "
Paver 34E	5 " "

Typical Fuel Consumption Rates

(As reported by Caterpillar Tractor Co.)

Model	Excellent Conditions	Average Conditions	Severe Conditions
D9 tractor (torque convertor)	13.2	14.7	16.3
D9 tractor (direct drive)	9.3	12.0	14.7
D8 tractor (TC)	8.3	9.2	10.1
D8 tractor (DD)	5.7	7.5	9.2
D7 tractor	3.9	5.0	6.2
D6 tractor	2.8	3.5	4.2
D4 tractor	1.9	2.4	2.7
DW21 scraper (2 axle)	6.5	7.9	9.3
DW20 scraper (3 axle)	6.0	7.4	8.8
DW15 scraper (2 axle)	5.5	6.5	7.5
No. 12 motor grader	2.5	3.5	4.5
No. 977 tractor shovel	3.6	4.5	6.1
No. 955 tractor shovel	2.9	3.6	4.8
D315 electric set 50 kw		5.0	
D326 electric set 100 kw		9.5	

Texas A and M's grounds are spacious enough for many phases of operator training and equipment testing to be carried on simultaneously.

A group of operator trainees go over a scraper to get acquainted.

Texas College Tests Construction Equipment

The Texas A and M College, which for 14 years has offered courses in construction engineering, and more recently in operator training, has expanded its services to the industry. The school now is making performance tests on construction equipment.

This new program is an outgrowth of the operator training program, which was initiated in 1957 following a survey by AGC's Texas Highway Branch which pointed to the need for more and better trained equipment men.

The new testing program will be described, but first a word on the operator training. AGC leaders discussed the operator school idea with the college's Engineering Extension Service, which because of its record of training in other fields seemed a logical agency to undertake the job. After extended studies the Extension Service agreed to conduct two 6-week operator courses, one for heavy construction equipment and one for power cranes and shovels.

The first courses beginning late in 1957 enrolled 14 students, 11 of whom were sent by Texas contractors. In December, 1959, the fourteenth offering of these courses was completed, with a total cumulative enrollment of 219 students from 33 states, Canada, France and Lebanon. While contractors have sent many of their employees, enrollment is open to any man who can satisfy the admission requirements: at least 18 years old, good moral character, etc. Total tuition is $350 covering instruction, texts and necessary materials.

The operator courses are conducted under A. L. Kramer, coordinator, assisted by well-qualified instructors. The courses cover both classroom and field experiences, with emphasis on the latter. For two weeks the student observes and operates each type of equipment, thereafter concentrating on the equipment in which he wants to specialize. The course gets into such subjects as mechanisms, engine power, fuels, lubricants, preventative maintenance, and maintenance; also keeping of the costs of operating, repairing and maintaining equipment is included.

Repeat courses scheduled for 1960 include the following beginning dates: February 29, April 18, June 6, July 25, September 12 and October 31.

The college has made available several hundred acres of land for use in the courses. Construction equipment worth about $1,000,000 has been furnished for the students by distributors and manufacturers. Included are crawler and wheel tractors, scrapers, dozers, front-end loaders, motor graders, rollers, power shovels, draglines, hoes, clamshells, cranes, etc., together with service equipment.

Graduates besides becoming excellent operators should, with further experience, often qualify as equipment foreman or superintendents, or as trainees of other operators.

The recent expansion into equipment testing was a logical extension of this operator training. Engineering Extension Service leaders feel that such performance testing, on a strictly impartial basis, should result in the development of improved equipment with benefit to both manufacturers and users.

An example of this service is illustrated by tests conducted recently to determine the production rate for a tractor-pulled scraper, equipped with conventional smooth cutting blades compared with the new type blade (Shunk 'Gator Twistooth blades). New blades were used for both tests. The equipment consisted of a Caterpillar DW15 tractor-pulled scraper and an International TD20 crawler tractor for push-loading.

The tests were conducted under the supervision of R. L. Peurifoy, former professor of construction engineering at the college, who was assisted by school personnel.

As a means of assuring that the tests would be conducted on earth having the same physical properties, two parallel pits, immediately adjacent to each other, were selected. All operations were conducted under as nearly the identical conditions as possible. The earth varied from sandy clay to tough clay difficult to load, as indicated by the average loading distances required. (See table.)

The scraper equipped with smooth blades was operated in one of the pits for approximately one day, during which time the number of loads was recorded. After the excavation was completed the quantity of earth removed was determined by measuring the pit. From this information the average volume of earth per load, expressed in cubic yards, bank measure, was calculated. Also, for each load the time required to obtain the load and the loading distance were determined. Then the smooth blades were replaced with Twistooth blades and the test was repeated, in the second pit.

The table gives the results of the tests. The long loading distances required are indications of the high resistance of the earth to loading (plus the fact that a more powerful tractor should have been used to assist the scraper for the existing loading conditions). However, since the same equipment was used for both tests, the relative results are considered to have comparative value.

It is anticipated that additional tests will be conducted in the future. Information concerning the operator courses or the testing program can be obtained by writing A. L. Kramer, Engineering Extension Service, Texas A and M College, College Station, Texas.

Results of Blade Performance Tests

Conducted on a scraper equipped with smooth blades and with Twistooth blades.

	Type of Blades	
	Smooth	Twistooth
Average load, bank measure (cu. yd.)	8.00	9.02
Average distance required to load scraper (ft.)	225	161
Average distance required to load one cubic yard (ft.)	28.1	17.9

The season's

Geo. M. Brewster & Son, Inc solution includes use of one dozer, this big 375 hp Michigan, to spread 25,000 yds daily on 3 fills

How would you handle a job where the state-specified borrow pit was on an island and the main fill was across 400 ft of river water . . . and where there were no bridges in between?

This was the puzzling problem faced by bidders on a 1,400,000 yd, 4 mile section of Route 129 Freeway near Trenton, New Jersey.

Think about it. What *would* be *your* method of bidding?

Would it be dredging? Some firms figured that way. Or building high trestles above the river to serve as haul roads? Or using barges to ferry fill across the water? Or what?

Flood danger makes speed essential

The successful bidder in this case had a different solution —one as novel as the problem. Geo. M. Brewster & Son, Inc, well-known Bogota, N. J. contractor, placed their bid, roughly $4,500,000, on a gamble. They would dam the inside channel of the river on its upstream side, let the water drain, then build several inexpensive earth causeways to the mainland fill area. The question was, "Could they move the necessary dirt quickly enough to avoid high water, yet economically enough to do the job at a profit?" For this river, the Delaware, has been known to rise at least 15 ft above its present normal stage. The bid was low . . . the job won . . . but speed became absolutely vital.

Fast mobile equipment and two 10-hour shifts per day were the basic choice. Yet for economy reasons a relatively small fleet did all work. A tractor-pulled and pushed belt-loader did the loading. Ten 16-yd bottom-dumps moved the fill. One machine—a high-speed 375 hp Michigan

most unusual job

Model 380 Tractor Dozer—handled *all* spreading.

Michigan replaces 2 or 3 crawlers

Brewster figures that because of its 25 mph speed and its power, the big Michigan replaced two or three large crawler dozers. *Working alone, it easily handled three separate dumping areas.* One pass forward leveled each long line of dumps . . . one in reverse back-bladed . . . then the Michigan would drive to another fill area where the operation would be repeated.

Tires help compaction

In this way, the one 375 hp unit took care of all 10 haulers and all fills. It regularly spread 25,000 yds of soft silty sand every 20-hour day. Despite high production demands, it even had time to clean up and make extra compaction passes. In fact, Brewster figures the large low-pressure tires on his 75,000 lb Michigan did the bulk of the compacting—even though the New Jersey Highway Department required final use of vibrating rollers.

. . . for more details circle 295 on enclosed return postal card

Unit also reduces maintenance

In the final analysis, dirtmoving completed long before flood season, use of the big Michigan had cut costs in some extremely important ways. One, it alone did the work of several of the biggest crawler-dozers. Two, it completely eliminated track maintenance and repairs, which in sand like this, could total $10 per hour, or more! Three, it proved versatile enough to spread gravel sub-base as well as sand fill, handle emergency truck towing, and do much of the compaction on all 3 fills.

Michigan job-proved Tractor Dozers could do the same for you! Pick the size to fit *your job*—162, 262, 375 or *600 hp*—then call your Michigan Distributor for a demonstration. You name the time and place.

CLARK® EQUIPMENT

Michigan is a registered trademark of
CLARK EQUIPMENT COMPANY
Construction Machinery Division
2479 Pipestone Road, Benton Harbor 16, Michigan
In Canada: Canadian Clark, Ltd., St. Thomas, Ontario

Michigan-push loads 19 yd Michigan-bowl in 30 seconds. Material: abrasive "dead" sandy marl.

How Howard W. Thomas Corp. licked the problem of operator inexperience

and boosted production

Like you're doing right now, Mr. Howard Thomas of East Bradenton, Florida, was reading a job story. A job story about the new Michigan Tractor Scraper line. Told, among other things, how the Michigans packed in more pay yards than comparable machines. Also, how their all-Clark power trains, with power shift transmission and torque converter, were producing higher average haul speeds.

Of course you don't buy scrapers from a magazine story alone. But you often check the facts first-hand. In this case, Contractor Thomas asked his Michigan distributor, Linder Industrial Machinery Co of Lakeland, for a demonstration. Of three Michigan Scraper sizes (10½, 19, 29 yds), they picked a 19 yard Model 210 as best suited to Thomas' needs. It was tested. Thoroughly. It did *even better* than the job story said it would. Mr. Thomas bought it! *And* he bought a matching (same power, same controls, same basic power train) 262 hp Model 280 Michigan *Tractor Dozer!*

Loads scale-weighed

The story of course doesn't end here. The next step was a series of jobs, ranging from the 60,000 yd state road subcontract pictured to a 700,000 yd housing project. On most, the Michigans worked alongside several other self-propelled scrapers. Contractor time studies showed a production advantage for the Michigan Scraper . . . though, because weight tests had never been made exactly, "how great" an advantage wasn't known. Then, one day, a leading competitor of ours brought in several time-study experts and a set of platform scales.

What they found sent them away shaking their heads.

For, the Michigan Model 210, weighed and timed over a lengthy period of time, had moved *77% more dirt per day than its rivals!*

1/3 more pay yds per load

Weight studies, alone, showed a 33% advantage. Michigan loads in typical Florida sand *averaged 14 pay*

Cutting to final grade, the 262 hp Michigan has power to effectively self-load.

Power-steered, power-shifted Michigan turns around non-stop on 35 ft roadbed.

77%

yards. Self-propelled Scraper "A," with heaped capacity of 17 yards (compared to the Michigan's 19), *averaged 10½ pay yards*. Self-propelled Scraper "B," capacity also 17 yards, *averaged 10½ pay yards*. Same material, same cut, same pusher (the Michigan 280), *same load time* for all scrapers.

1/3 more trips per hour

Haul studies showed a similar advantage. Traveling over a hilly, winding mile-long 'round-trip, the Michigan made 10 cycles per hour. The other two scrapers each made 7 cycles per hour. Higher top speed—plus the exceptional time-saving advantages of power-shift transmission and torque converter—accounted for the difference.

This Clark power train combination had another major advantage too, according to Mr. Thomas. "We were working with inexperienced operators," he recalls, "yet we had no worries about ruined transmissions. Nor was there any lugging down nor any wasted time shifting, so the Michigan Scraper always moved at the maximum speeds possible." Top speed—31.4 mph.

Why not see what Michigan's loading ability, plus job-proved power train can do to speed dirtmoving *on your job*. Your Michigan distributor will be glad to demonstrate for you. *Your* operators can, if you wish, do the operating . . . *you* can make whatever time and weight studies you think necessary.

. . . for more details circle 296 on enclosed return postal card

$4.50 per hour profit drain also eliminated

A year before Thomas' Michigan *Dozer* went to work, the company handled push-loading with a 40,000 lb class crawler. Did a fair job, but track replacement costs alone averaged $4.50 per hour. Every 500 to 600 hours, the crawler had to be pulled off the job and some 12 man-days invested in a track overhaul.

Then Mr. Thomas bought a rubber-tired tractor. Wasn't a Michigan, but it *did* end the track costs. Unfortunately, it also hurt production. This 30,000 lb machine just didn't have the necessary power, especially when turning under load. Thomas "tested" it for six months, then gave up and made a trade in November, 1958, for the 50,000 lb, 262 hp, Michigan Tractor Dozer.

Today, no more problem! Bigger, more powerful, faster on both pushing and dozing, the Michigan applies four-wheel drive at all times. Typical 14 pay yd scraper loads, in typical Florida sand or marl, take the Model 280 from 30 to 60 seconds. Tires, with the machine running year-around 10 hours a day, 5 days a week, still have almost all tread . . . are expected by company officials to last about 3 years (an estimate based on Thomas' experience with Scrapers). Power train, controls, many other parts are basically the same as on the Model 210 Scraper (also as in the Michigan 4½ yd Model 275 Tractor Shovel), hence maintenance and operator training are simplified, parts needs lower, push-loading efficiency higher than on "mixed" fleets.

Michigan is a registered trademark of

CLARK EQUIPMENT COMPANY

Construction Machinery Division

CLARK® EQUIPMENT

2479 Pipestone Road
Benton Harbor 23, Michigan

In Canada:
Canadian Clark, Ltd.
St. Thomas, Ontario

Small skid tanks often get rough handling and develop leakage.

A neat way to set up fuel barrels along a fast-changing job. J. C. O'Connor & Sons, Inc., Indiana. US 30 relocation.

PLANNING YOUR FUEL SUPPLY

Continued from page 125

A special reason why contamination may spell trouble is the fuel injection pump, with its very close clearance. Dirt should be given a chance to separate out of fuel by gravity, using a tank arrangement such as that shown in the accompanying sketch, where fuel should be stored for a 24-hour period before drawing off.

For field pumping, Standard (Indiana) cautions against using any drain-back unit in field pump installations. The drain-back does save a small amount of spilled fuel, but it also catches and drains back water and dirt, which spell engine trouble and down-time. Fuel that has become dirty or contaminated can make trouble with injection systems and engine operation.

Barreled fuel should be stored on the job with the barrels on their sides, not end-up. If the bunghole is up, rain may enter even if the bunghole is sealed. This happens because fuel expands during the day's heat, contracts at night, and the vacuum created sucks in any water on top. Barrels should be covered with tarpaulins if stored even for a few days, as an added protection against water and dust.

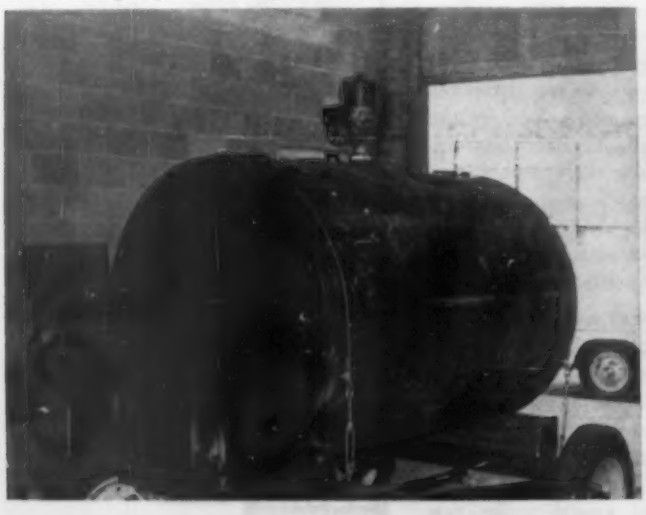
A new, portable oil testing laboratory for users of gasoline, diesel and gas engines is available. The Simplex (Lengor Incorporated) oil testing kit facilitates preventive maintenance by determining the presence of damaging contaminants in motor oils in use. The kit includes materials for conducting tests to find solid contaminants, fuel dilution and corrosive acids. The tests results require no interpretation or calculation; results are compared with a set of accepted standards. Also determined through use of the kit is the efficiency of the filter and the condition of fuel injectors, automatic chokes, carburetors, gaskets, thermostats, piston rings and other parts.

Think of Your Supplier

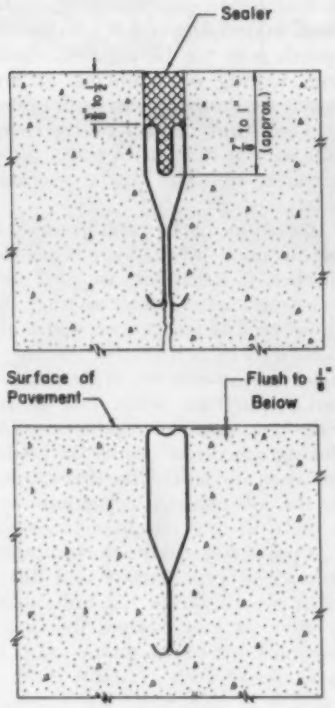
The distributor who supplies fuel for your job has a modest profit margin to work with, even when

Continued on page 160

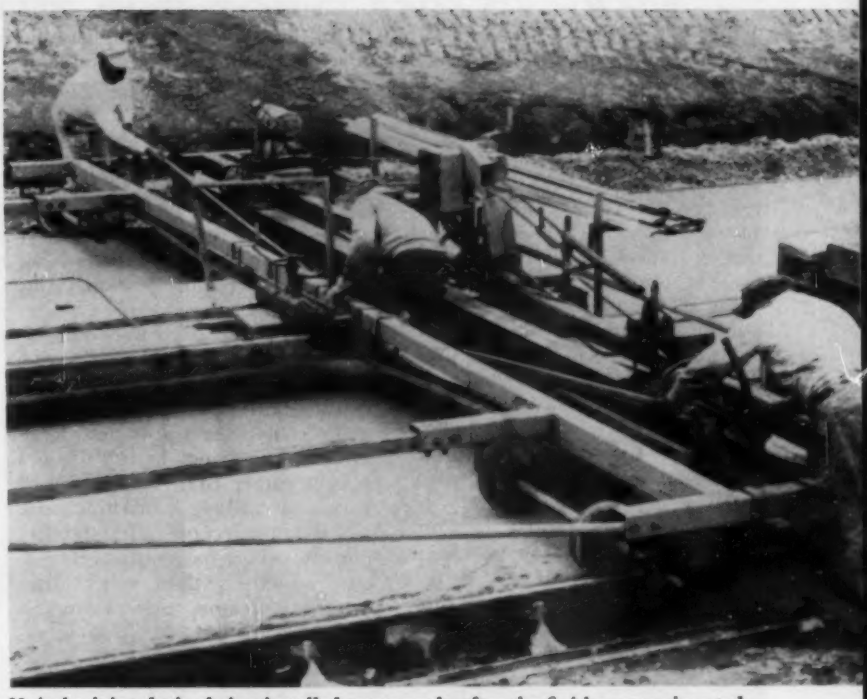
Recommended: Cart unit complete with 300 to 500 gal. tank and electric fuel pump. Ready to go anywhere.



Prescription for a clean tank: Steam clean it following welding a leak, as seen on Yonkers Contracting Corporation job in New Jersey.



The joint former after installing and after later crimping and sealing. Made of 30-gauge SAE 1010 sheet steel.



Unitube joint device being installed transversely after the finisher pass; inserted through guideslots and vibrated into place.

'Sawless' Joint Forming Device Widely Tried

A new joint device has contractors' enthusiasm in several states because it eliminates sawing as well as most hand forming labor. As with any joint device, this one will need the test of time to determine its functional permanence. But meanwhile several state highway departments have permitted the device, and already over 3,000,000 lineal feet of Unitube installation has been made on road and airfield projects.

The device, developed by William Middlestadt, president of the Middlestadt Corporation, consists of a hollow insert strip of lightweight galvanized steel. The sides taper together at the bottom to facilitate mechanical insertion into the wet concrete. Flanges turn outward and upward at the bottom to form a claw, imbedding each side of the flexible metal insert to the slab so that it spreads when and as cracking and joint opening occurs.

The folded metal strips formed to the specified dummy joint depth are precut to desired lengths. Ten-foot lengths, which interlock end-to-end, are installed to form the longitudinal joint. Transverse joints are placed from the side forms to the centerline where they butt against the longitudinal joint.

A two-man crew works from a specially designed rig which rides the forms behind the finisher. A vibrating "T-bar" device is used to form a groove in the fresh concrete and then push the device to the proper depth.

A one-man operated mechanical vibrating "crimper" machine is run down each joint, after the curing period, folding the top of the metal tube inward and downward. This produces a V-shaped groove ½-in. deep to carry the sealing compound, which is placed by normal methods. The sealed insert bellows with the continually expanding and contracting slabs, holding the sealer up where it belongs and thus lessening maintenance cost.

A major design advantage claimed for the folded metal insert is that it creates a joint depression of the right width and shape (wider and shallower than the traditional deep narrow cut, less likely to lose its bond).

WHEEL-TYPE LOADER

Continued from page 118

several factors deserve brief but separate mention.

One of these factors is bucket reach, the distance from the most forward point of the chassis to the edge of the bucket in dump position. As shown in Table 3, this varies from model to model and can be critical for efficient loading into the center of truck beds.

Bucket dumping height is important if the wheel-loader purchased must load high-sided trucks. Table 4 shows dumping height of ten machines, measured from ground level to center of the bucket hinge pin. A shorter distance, from ground level to lower bucket edge, is shown in Table 5.

Both distances should be considered. If the bucket in dump position will clear the sides of the truck, cycle times should be faster because operators do not have to raise the bucket before backing away. Along this same line, devices such as automatic bucket positioning mechanisms on some units cut cycling time and often help a smaller wheel-loader out-class a larger one.

Chassis components. Engine power ratings again represent a manufacturer's view expressed in his own terms. Most builders list a maximum horsepower rating to identify work potential. With naturally aspirated engines, especially gasoline models, cubic inch piston displacement is a reliable indication of an engine's ability to deliver a certain amount of power through a reasonably long service life. For example, a 420 cu. in. gasoline engine rated at 100 HP will probably produce more power longer than a 350 cu. in. gas model rated at the same output.

With turbocharged engines, particularly diesels, piston displacement is not a good yardstick. Here, the manufacturer is obliged to rate horsepower, balancing power output against economically long, total engine life.

With this in mind a potential owner of a loader with either type of engine should make his own judgment on horsepower. To do this, he should compare working performance and productivity of each machine against an estimate of engine durability and operating cost based on experience or the manufacturer's reputation.

In the choice between gasoline and diesel, other factors should be considered. Briefly, gasoline engines may be lower priced, their workings may be better understood by mechanics, and their fuel more readily available. They should receive serious consideration for utility applications.

Diesel engines have better lugging ability, require few operating adjustments, operate on low cost fuel, often operate more hours between over-hauls and often have a longer total life. They pay on heavy, continuous jobs.

True machine size is best determined by studying physical size and weight rather than bucket size or lifting capability. A machine's size and weight affect operating stability and contribute more to wheel-loader productivity than many other factors. Operators tend to work a loader at its safe, comfortable capacity rather than at its peak. Higher effective working speeds, bucket loads and production often come from providing safer, more comfortable operator conditions.

Roadability and operating stability should be checked before purchase. Published specifications of many machines list top forward and reverse speeds of more than 20 mph. On a specific job with its particular conditions of footing, grades and material weights, maximum speeds may not be possible. Pitching, yawing or bouncing at any speed are dangerous to both operators and equipment. Real top speed of a unit at work or in travel is the speed at which it can be operated safely.

Based on the Caterpillar analysis of the many wheel loaders on the market, it is difficult to label one machine "better" than another because of this feature, or that component. The real cost of owning a machine comes down to the total of initial purchase price, cost of repairs, and value of production lost during downtime minus the trade-in value, and a machine that cannot do the job required is the most expensive at any purchase price.

A purchaser seeking the optimum balance of productivity and durability which serves his individual needs must look beyond the specification sheet to the on-the-job performance of each available unit.

NEW EXPRESSWAYS BUILT in Michigan have brought a sharp drop in accidents compared with the old facilities they replace. Figures for 16 different expressway sections: 1,561 accidents, 20 killed, on the old roads; 359 and 6 for the new, in comparable 12-month periods.

Big New Aggregate Fleet

Lamar Equipment & Supply Company, of Paris, Texas, has placed in gravel-hauling service 32 International model B-182 tractors with liquefied-petroleum-gas fuel systems. This $175,000 fleet has been leased by Lamar Equipment from D. & B. Trucking Company, Inc. Rated at 40,000 lb. gross combination weight, the tractors pull 10-cu. yd. dump trailers. They were running between gravel pits in Oklahoma and road surfacing jobs in northeastern Texas. Engines are International BD-308 sixes rated at 154 Hp. Equipment includes 2-speed rear axles, direct-in-fifth transmissions and heavy-duty front and rear springs.

DOW | **LATEX FOR PORTLAND CEMENT**

BEFORE—Heavy traffic and freeze-thaw conditions eroded concrete on a Michigan bridge leaving a very poor road surface.

AFTER—Two years and 200 freeze-thaw cycles after a ½" resurfacing with latex-modified portland cement. Road shows little sign of wear.

Now . . . cut preparation time and expense

with latex-modified portland cement patching

Here's how you can patch concrete roads, bridges, and get far greater savings in preparation cost and greater durability, too—than ever was possible with conventional asphalt or concrete patching!

There's no need to remove or replace large volumes of concrete when you patch with Dow latex-modified portland cement. That's because the patches require a minimum depth of only ½"—instead of the 2" to 4" depth required with conventional patching materials. This means no extensive jackhammer jobs—a big saving in time and labor. The road surface is back in service in only a fraction of the time usually required for conventional patching.

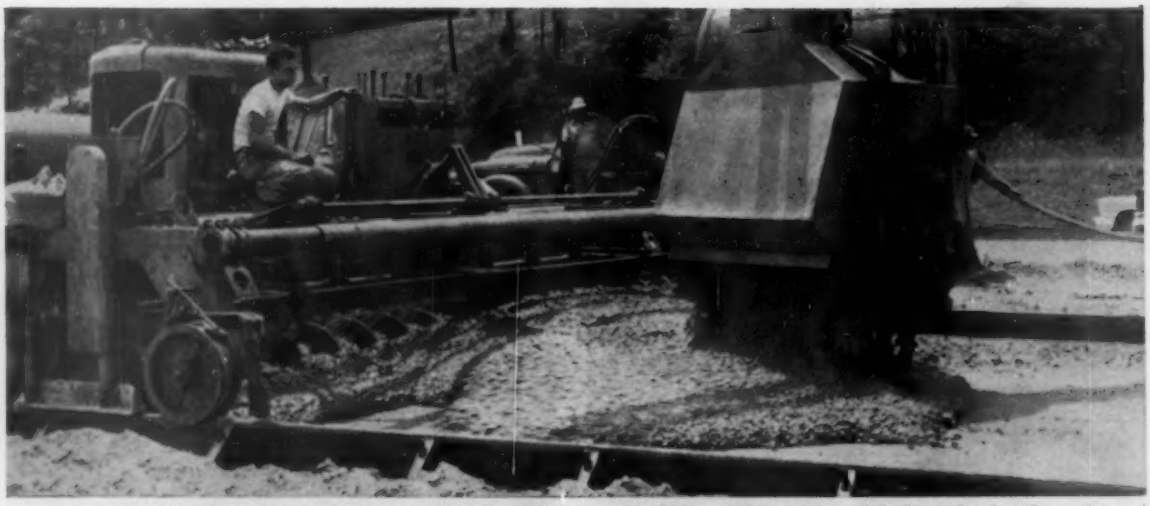
Portland cement modified with Dow Latex shows remarkable durability, too. Recent tests on a Michigan bridge, for example, shows no spalling . . . no pitting . . . practically no wear after two years of heavy traffic and approximately 200 freeze-thaw cycles!

What's more, latex-modified portland cement exhibits low water absorption, greater flexibility, higher tensile, compressive, and bond strengths, and has an expansion-contraction rate similar to concrete thus reducing stresses on the patch.

Write for more information today. THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department 1950EK3.

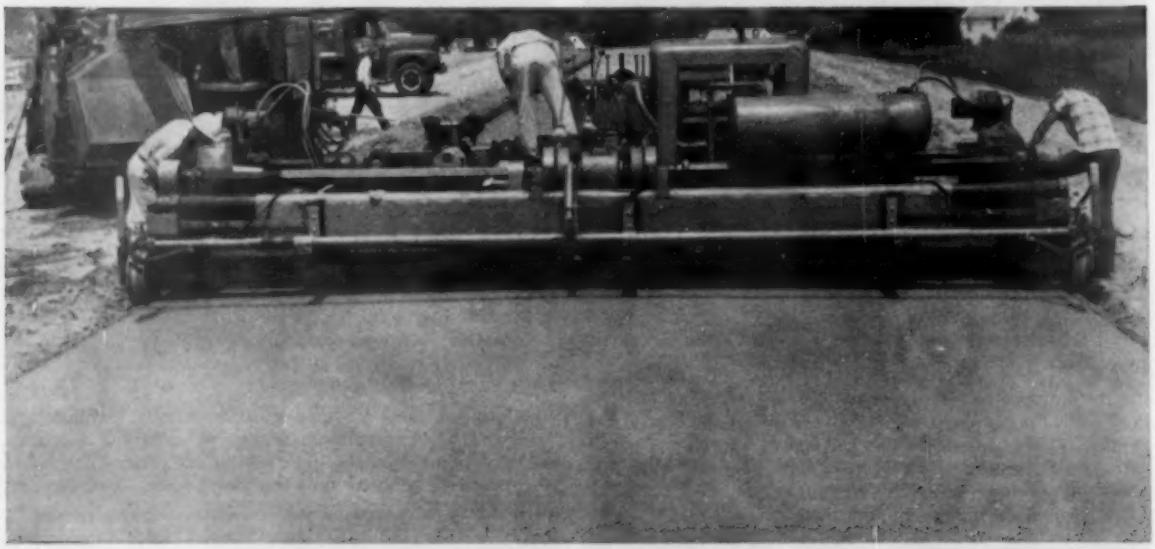
THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

. . . for more details circle 304 on enclosed return postal card

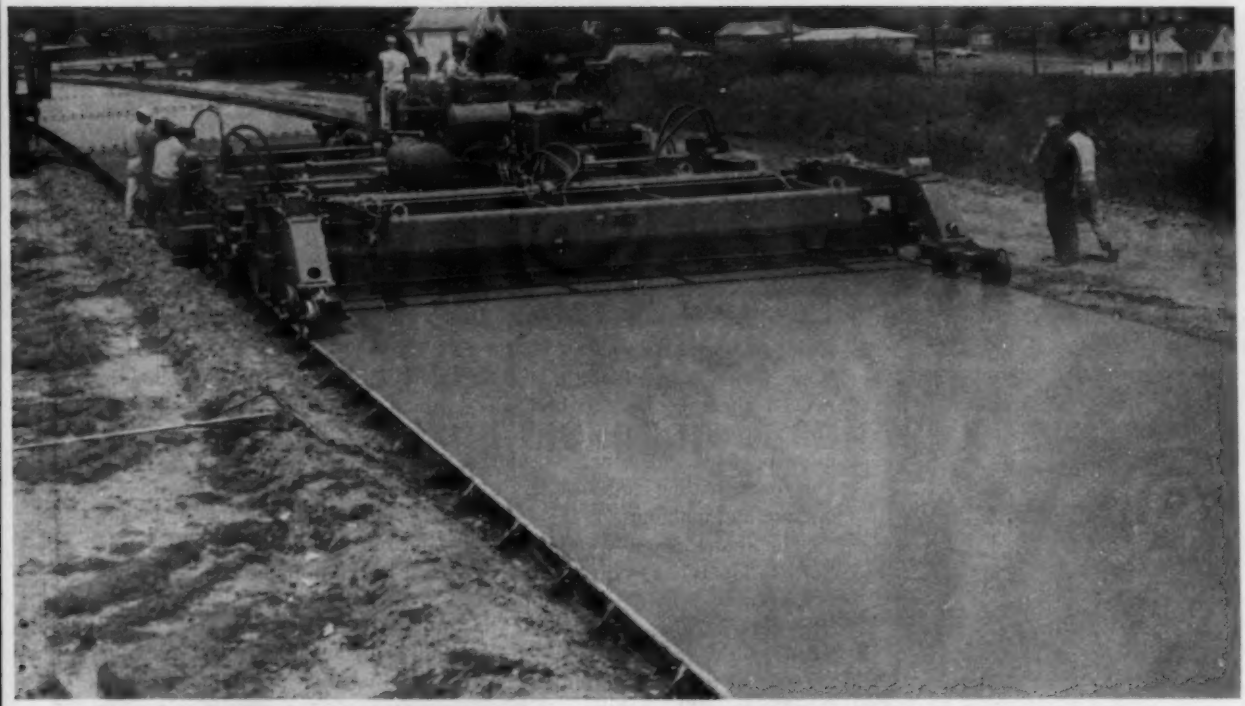


1 **HYDRAULIC SPREADING SCREWS,** controlled by light-touch levers, remix as they spread to form a denser, stronger, uniformly-textured slab. Eliminate segregation and honeycomb. Right and left screws can be started, stopped or reversed independently. Operation of screws, and lifting and lowering of screws, strike-off and screed, are controlled with perfect ease and smoothness of hydraulic operation. Jaeger originated screw spreading.

2 **PLACEMENT OF A SECOND COURSE** is easily handled by the same spreader-finisher if only one paver is used. With two or three pavers, top-speed continuous progress is maintained by adding a Jaeger spreader to place and strike-off the base course and following with your spreader-finisher on top course after mesh has been laid.



3 **BEHIND THE SPREADER. LOOK AT THE IDEAL SURFACE THE FINISHER WILL WORK ON:** One man, on Jaeger spreader-finisher, not only does the spreading but also finishes an accurately metered surface ahead of the finishing machine. Metering here reveals any excess or deficiency of material where it is easy to correct.



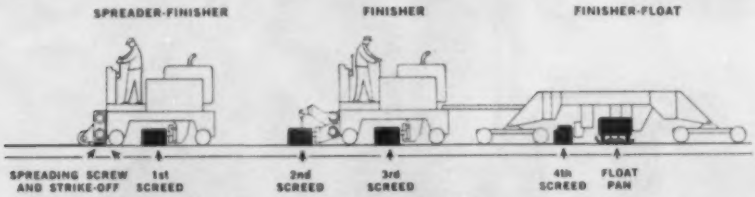
4 **FINAL FINISHED SURFACE IS AN ENGINEER'S DREAM:** Towed by a Jaeger tandem screed finisher and controlled by the same operator, the Jaeger finisher-float gives the final 4-to-1 correction of any surface inaccuracies. It rides on bogie axles. Its oscillating screed and float pan are both suspended, independent of form levels alongside. (You can also use this float-finisher behind any make of finishing machine. Detaches in 2 minutes).

HOW 2 MEN LAY SUPER-SMOOTH PAVEMENT WITH JAEGER 4-SCREED TEAM

One spreads and finishes, the other finishes and floats. For 2-course work, simply add a base spreader.

By using Jaeger's *integrated* paving train, low-bid contractors are saving labor all along the line — and delighting highway inspectors with the smoothness of their finished slab. On single-course work, here diagrammed, one spreader operator does the spreading, strike off and first finishing pass with oscillating screed — all in the one pass. On 2-course pavement, if you are using only one paver, the same machine also spreads, but does not screed, the base for reinforcing mesh.

For fast, 2-paver production of 2-course slab, you need only add another spreader, without a finishing screed, to lay the base.



Only one more machine operator is needed behind. He controls both the Jaeger tandem screed finisher and the Jaeger finisher-float. This last machine can be towed by, and operated from, any finisher. It imparts the final kiss-finish with its narrow oscillating screed and 30" wide float pan.

MACHINE-PERFECT, READY FOR BURLAP

Both the screed and pan of the finisher-float are suspended, independent of adjacent form level and its bogie axles provide a 4-to-1 ratio of correction. The accuracy of finish being obtained with this equipment is typically described by a leading highway engineer as *"the smoothest pavement I have ever seen."*

COMPLETE DATA ON REQUEST

Hydraulic control, quick-crown-change and width adjustability (hydraulic self-widening where desired), diagonally adjustable finishing screed and many other valuable Jaeger features are described in latest catalog. Ask your Jaeger distributor—or write us.

THE JAEGER MACHINE CO., 223 Dublin Avenue, Columbus 16, Ohio

JAEGER MACHINE CO. of CANADA, LTD., ST. THOMAS, ONTARIO

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payload on our other trucks on the same job!"

Again in '60... FORD PICKUPS beat all leading makes in Gasoline Economy!

Ford Six delivers 13.1% better gas mileage in second running of Economy Showdown U.S.A.* Standard 1960 ½-ton pickups of the five leading makes were purchased from dealers just as you would and run both empty and loaded, over flat terrain and hills, at low and high speeds, under city traffic and retail delivery conditions.

Certified results show the Ford Six won *every* test—with a combined Ford advantage for all tests of 13.1% more mpg than the average of the other makes tested. In fact the Ford Six beat one competitive pickup by a whopping 27%.

The 1960 Fords not only deliver the best gas mileage of the leading makes—but they do it without sacrificing any of the performance characteristics for which Ford is famous. And, this year, if you buy a Ford instead of a competitive truck, you can be sure to save!

Check the certified records for yourself in your Ford Dealer's "Certified Economy Reports" . . . see and drive the new Ford Trucks . . . check the price tags . . . *and you'll save for sure!*

*Over-all economy test conducted by America's leading independent research organization (name available on request)

COST LESS

LESS TO OWN . . . LESS TO RUN . . .
BUILT TO LAST LONGER, TOO!

. . . for more details circle 310 on enclosed return postal card

Silva and Hill bladed and sprinkled intensively to keep the roads firm and smooth.

Thirsty Desert Project

Another example of extensive pit irrigation, and rapid grading and paving under extremely adverse conditions by high-production fleet.

Sand, sand, everywhere, but not a grain for roadbuilders. Almost every dune in the area was being held for possible development of homesites. What a predicament for a contractor with 9.48 miles of freeway to build across the desert from Indio to Thousand Palms, California.

Silva & Hill Construction Company, Los Angeles, and Massey Sand & Rock Company, Indio, took the $1,757,460 contract to widen existing US 60-77-99 to a four-lane, limited access Interstate highway. Cuts and fills were minor—only 3 to 4 ft.—except for three road crossings. Removal of sand dunes for the Jefferson Street overcrossing at the southern end (300,000 cu. yd.) supplied most of the fill needed for the roadbed up to and the approaches for the Washington Street over-crossing, about a fifth of the way up the job. But 335,000 cu. yd. of borrow was needed for the remainder of the roadway and approaches for the Kubic Road overcrossing at the northern end. Four pits were finally located along the right-of-way, but hauls still average 1½ to 2 miles from pit to fill.

Once sufficient material had been arranged for, Silva & Hill had to tackle a continuing problem—adequate moisture. The powder-dry sand had to be brought up to 10-13 percent moisture content. The contract called for 100,000,000 gal. of water. Bill Leaverton, project manager, had to pour in 60 gal. per cu. yd. to reach and hold compaction. Water rights are tightly controlled in this very dry desert region. A deep well provided water for the 40-ft. Jefferson St. cut; the remainder had to be purchased from a local supplier's pipeline.

Cuts were prewatered for two weeks before excavation began. Water was piped in through 2 miles of 6-in. aluminum pipe, dropping to 4-in. lines feeding Rainbird sprays. All pipe joints were sealed with vitaulic couplings to stop leakage of the precious fluid.

Constant winds, high temperatures and low humidities quickly dried the compacted material, softening the roadbed. One night the wind blew 6 in. of fill from one side of the roadbed to the other. Sand has drifted as much as 10 ft. deep. To prevent the fill from drying too much, cement-treated base has been placed over finished grade within 24 hours.

Clearing the right-of-way went fast with two specially-equipped tractors. One D8 using a brush rake with teeth on 6-in. centers cleaned the entire surface in two days. A ripper-equipped D9 needed only a half-day to pull up troublesome roots.

Leaverton moved in 7 Caterpillar DW21 and 6 DW20 tractor-scrapers, 2 D9s and 5 D8s to handle the 465,000 cu. yd. roadway excavation and 335,000 cu. yd. of imported borrow. One part of this high-production fleet, 6 DW21s and 3 DW20s, push-loaded by 2 D9s, hauled 200,000 cu. yd. of fill as far as 10,000 ft. into the Washington Street overcrossing, between May 11 to July 1, working on 9-hour, 5-day shifts.

On the fills, sand was precisely spread for compaction in lifts by the speeding scrapers. Close behind came the water wagons, soaking the sand to keep it in place. Five wagons were kept busy on this task—a 5,000-gal. converted LeTourneau C, a 3,000-gal. D, a 3,000-gal. truck and two 2,500-gal. 6-wheel drive trucks.

Damp sand being heap loaded by a Cat D9 in a pit that was prewatered for two weeks.

The soaked sand was then smoothed by the fleet of 4 Cat No. 12 and 1 AD Super 99 motor graders. Two 50-ton Southwest pneumatic rollers pulled by a DW21 and a D8, finished the lifts, reaching required compaction in 2 to 3 passes.

Good haul roads were a key to the sustained high production. Without them the high capacity scrapers would have wallowed through the soft sand. The long hauls involved demanded high production to profitably meet the schedule. Project manager Leaverton assigned a water wagon and a motor grader to patrol the roads, keeping them damp, firm and smooth. Evidence that this extra attention paid off was that each scraper averaged 3½ 18-yd. (bank measure) loads an hour over a 2½-mile one-way haul, an average speed of over 20 mph.

Silva & Hill started grading April 1. With the high production resulting from utilizing the capacities of every machine, Leaverton expected to be finished in October, well ahead of the 300 working days allowed. He was assisted by Irv Hill, office manager; Joe Valente, mechanic; and J. D. Taylor, grade foreman.

As the grading sped along, Massey Sand & Rock

Fast loading water station helped keep the dry sand up to the moisture content.

High speed compaction in progress with a 50-ton Southwest roller, Cat DW21 drawn.

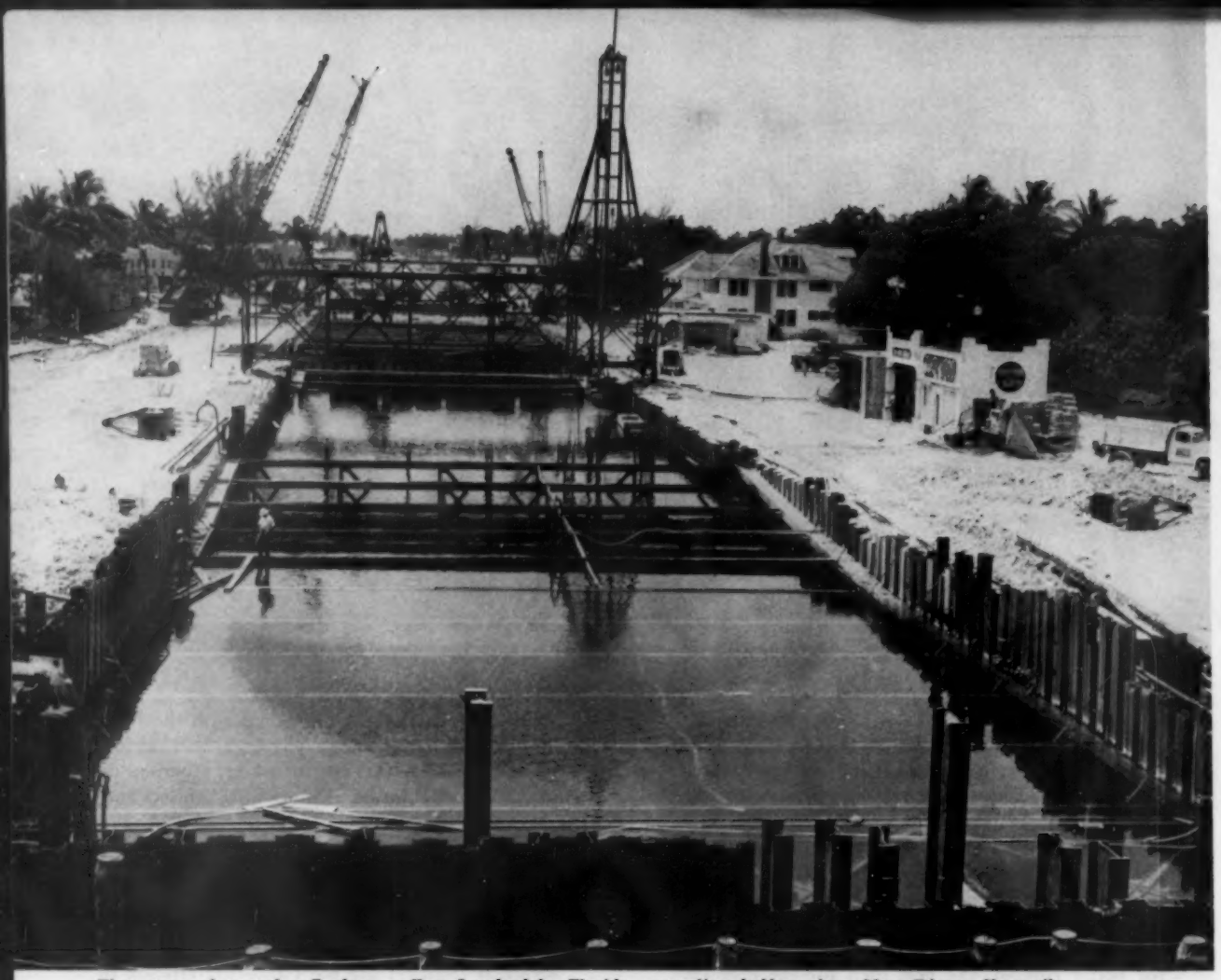
Co. followed close behind with base materials and paving. Tom Carter, general manager, and Fred T. Mass, project superintendent, used a fleet of 22 IHC 190 trucks with 10-yd. dump beds for the haul from the company's plant to the job site. Untreated base material was dumped on the roadbed and spread in an .83-foot layer by Massey's three Cat 12 graders, then compacted to 90 percent by two Browning and Tampo rubber-tired rollers.

Portland cement-treated base was plant mixed for better control, [illegible] first such use on highway construction in sou[illegible]n California. Material was laid in a .42-foot layer by a spreader on the front of a D8. Plant mix asphalt paving is laid .33-foot thick by a SB-60 Barber-Greene paver, mounted on rubber. Two Galion 8-12T steel wheel rollers handle base and paving compaction.

This well-balanced spread daily handled 2,500 tons of untreated base, and either 3,200 tons of cement-treated base or 1,500 tons of paving. Assisting Mass were L. J. Christianson, grade foreman; and Dwight Porter, plant mix foreman.

Resident engineer for the California Divison of Highways was Dave Shepard.

Heading up Silva and Hill on the Indio-Thousand Palms Freeway: J. D. Taylor, grade foreman and Bill Leaverton, project manager.



First stage of tunnel cofferdam at Fort Lauderdale, Florida, extending halfway into New River. Sheet-pile bulkhead in foreground is at mid-channel. The small pile rig on the nearest traveling bridge drives casings for tremie anchor bars, while a pulling device on the second bridge tests strength of embedded bars.

Cofferdam Trick: Grouted Rods Anchor Thin Tremie Seal

The contractor building the cut-and-cover vehicular tunnel across Florida's New River has used a radical system of anchoring a tremie seal with saving of substantial time and money.

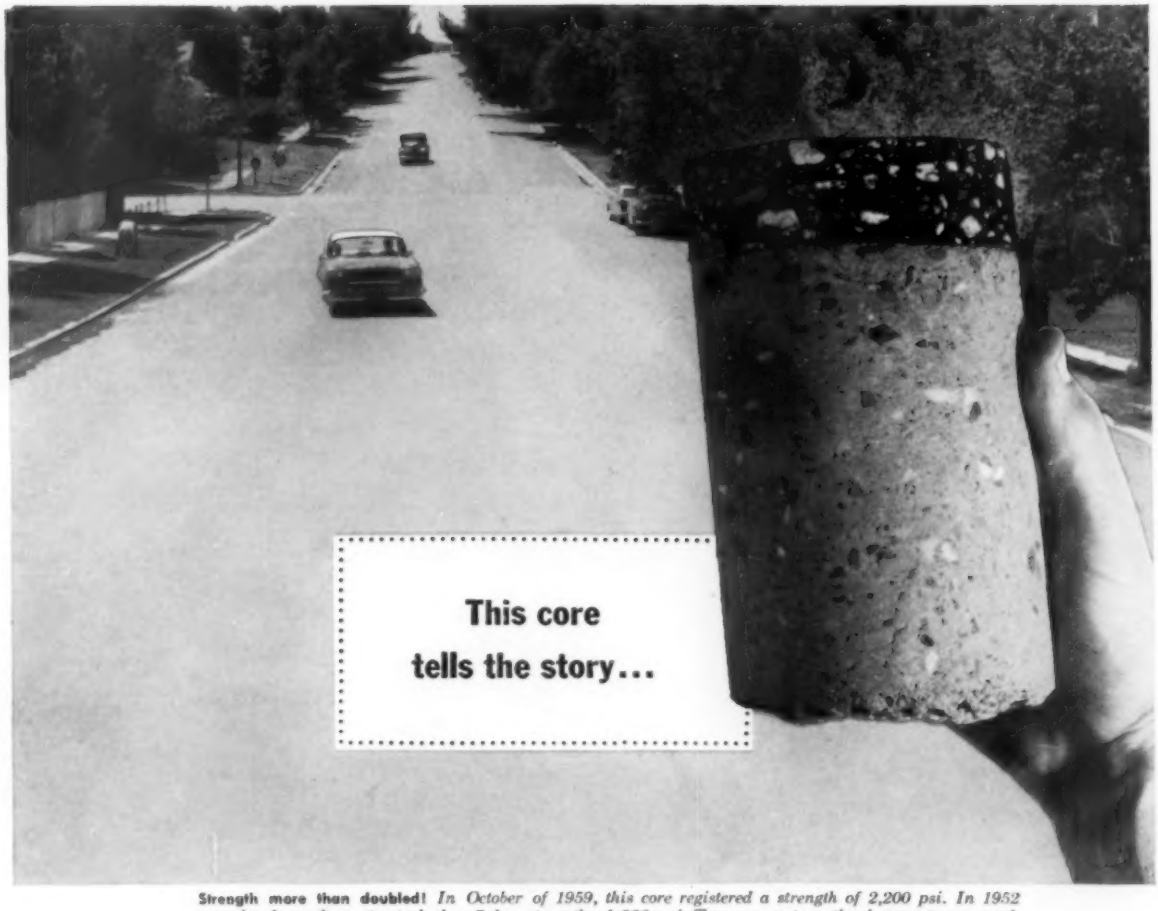
Not that there weren't anxious moments when the sheet-pile cofferdam was being dewatered. Thorington Construction Co., Richmond, Va., was trying an unheard-of method of holding down a veneer-thin seal with anchor bars grouted into layers of sand and limerock. All eyes were on the cofferdam during dewatering, but as the water level dropped, there were no signs of a "blow."

The problem during dewatering was to counterbalance the hydrostatic uplift in the highly porous limerock. A conventional gravity-type tremie seal would have had to be as thick as 28 ft.—requiring extremely difficult and costly limerock excavation,

Continued on page 147

No name in heavy hauling equipment merits more respect for reliable performance than Reo's rugged line of trucks. Every Reo is engineered to its specific job . . . custom built completely to it . . . and powered by the most advanced high-efficiency engines available—gas, LP-Gas and Diesel. This power is coupled to power train components of proven performance, assuring speed and agility under full loads. To reduce chassis weight, Reo's framework is engineered to provide the ultimate in strength with the lowest possible weight. **Additional allowable payload within legal limits is possible through Reo axle placement.** For information on Reo's complete tandem line, including special models for **transit mix, dump work** and **oil field service,** write for new model folder. REO DIVISION, The White Motor Company, Lansing, Michigan.

GOLD STANDARD OF VALUES



Strength more than doubled! *In October of 1959, this core registered a strength of 2,200 psi. In 1952 samples from these streets had a 7-day strength of 936 psi. Ten per cent portland cement was used.*

In just 7 years, strength of soil-cement streets in Gillette, Wyoming, increased 135%

...soil-cement pavement grows stronger year by year!

Core test proves conclusively: soil-cement outlasts any other low-cost paving material! Soil-cement is stronger inch for inch than any other paving material, short of concrete. Yet, in most cases, 75% of the materials are free.

Your main ingredient is soil . . . even old gravel bases or broken-up blacktop can be mixed in. This is combined with portland cement and water, then covered with a thin bituminous wearing surface when the soil-cement hardens. Contractors have built as much as two miles of soil-cement pavement in one day.

Potholes or soft spots are a thing of the past. Soil-cement has beam strength that spreads the traffic load over the subgrade.

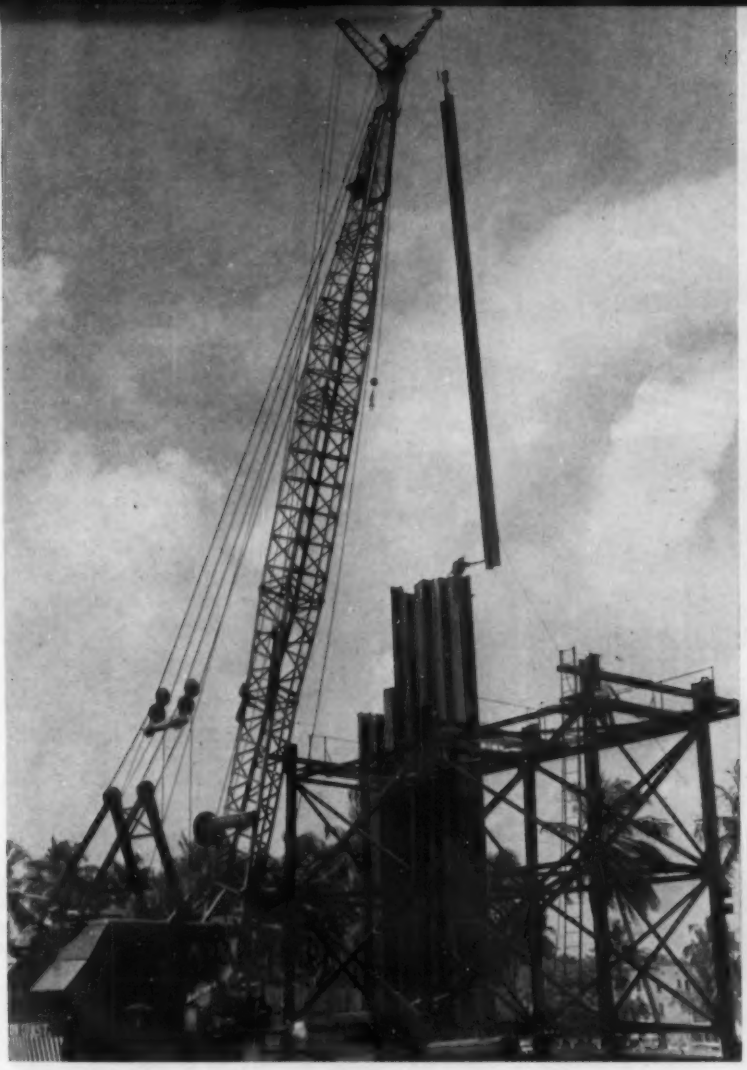
Maintenance is really low. Coupled with a low first cost, it means street budgets go further . . . permitting long range programing by engineers.

More than 500 cities and towns throughout the country have successfully used soil-cement paving.

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of portland cement and concrete

MODERN
soil-cement



Long length of Foster MZ-38 sheet piling being threaded into interlock by Manitowoc 3900 crane using 130-ft. boom. Steel frame template guides the setting. Guide beams at top and bottom of template are easily adjusted to align panel of piles.

THIN TREMIE SEAL

Continued from page 144

to say nothing of a huge quantity of concrete. At the deepest point, the tunnel floor is about 50 ft. below water level.

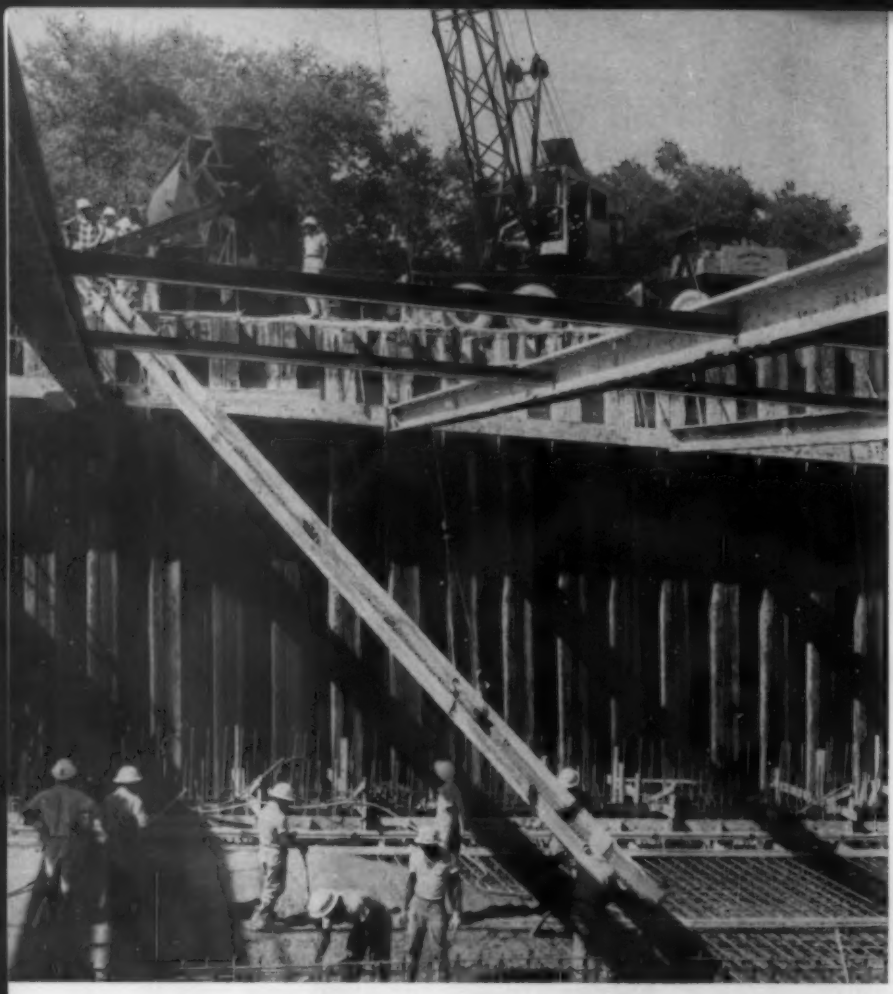
Thorington's engineers, hoping to rule out the thick tremie, designed a thin 4-ft. seal anchored by No. 11 reinforcing bars embedded in unique cast-in-place uplift piles.

The method: a small pile rig, on a traveling bridge spanning the long cofferdam, drove 7-in. diameter pipe casings into the limerock with a McKiernan-Terry 9B3 hammer. (The casing's tip was closed with an expendable driving cap.) After each casing was driven the crews (1) pumped in grout, (2) inserted an anchor rod, (3) retracted the casing and (4) moved to a new location to repeat the procedure.

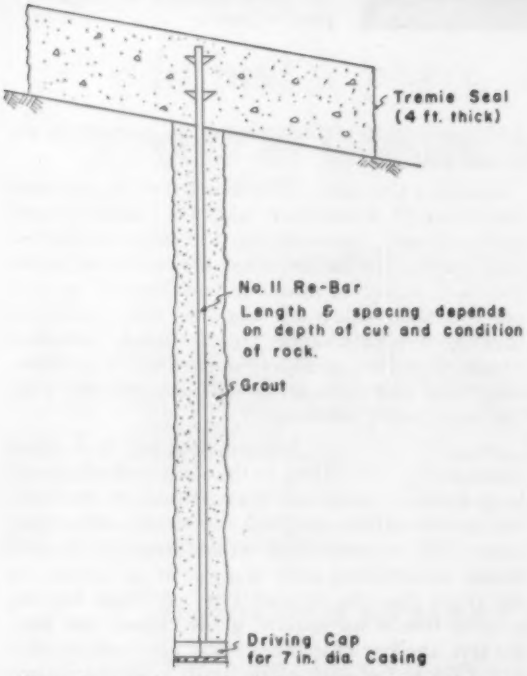
After a suitable curing period, all of the more than 2,500 anchor rods were tested with a measured pulling force exerted by a winch mounted on a second traveling bridge. The rods with lengths from 20 to 72 ft. were fitted with fish-tail holding plates on top to increase anchorage strength in the tremie seal.

Complex Contract. The New River Tunnel near downtown Ft. Lauderdale takes US 1 under a navigable channel, necessitating a 2-stage method of construction. In the first stage, the contractor builds the south section of tunnel to mid-channel. A sheet pile bulkhead seals it off. Then the river is diverted over the completed tube, and the north cofferdam begun, also, as a two-stage operation. The 850-ft. long tube and approaches will provide two 24-ft. roadways and a sidewalk.

Sheet Pile Strategy. Foster-rented MZ-38 or equal interlocking sheet piling in the south cofferdam will be pulled and re-used on the north side of the river. An easy-to-adjust template is saving pile-setting time. This two-story-high welded assembly of steel beams cross-braced with angle iron is spotted by the crane over the cleared area. Without wasting time to line it up exactly, guide beams, one near the top, another near the ground, are made to slide out. One end of each guide beam is butted against the sheet pile already driven at the corner of the



Long chute fitted with baffles to prevent mix segregation delivers concrete from ready-mix truck to tunnel floor. A Lorain truck crane spots the chute.



How the tremie slab is tied down to the coral rock to resist hydrostatic uplift.

cofferdam. By sighting along the line, the crewmen set each guide beam "right on the money." Steel pins lock them securely in place.

Three Manitowoc cranes are handling pile driving. The first sets the piling, sliding each sheet into place against the template's guide beams. The other cranes, each with an air-powered McKiernan-Terry 10-B-3 hammer, follow up, driving the piling to grade through the underlying limerock and coral. The team finished the first stage wall (about 1,800 ft. around the perimeter) in 90 days.

Work was speeded with a smart cofferdam trick. The idea was to get part of the area dewatered as soon as possible. Excavating and sealing the entire south cofferdam figured to take too long. So the section was split in two by driving a sheet pile diaphragm across the cofferdam. Thus building could begin in the upper section while crews simultaneously dug and dewatered the rest of the cofferdam.

Air-Lifted Rock. Excavation inside the south cofferdam, now completed, was a slow and delicate task. Draglines pulled out most of the 80,000 cu. yd. of rock and sand. Cofferdam bracing was placed consisting of steel cross-beams, set on 15-ft. centers, framed into walers bolted to the side walls. The deeper levels required a double tier of braces.

Continued on page 161

Operators and Mechanics Bulk High in BPR Labor Analysis

Each billion dollars of highway and bridge construction work under contract in the U.S. generates the employment of approximately 48,000 men with a weekly payroll of $4,650,000. This is the finding of a study just completed by the U.S. Bureau of Public Roads, probably the deepest analysis to date of the use of labor in highway contract construction.

Equipment operators and supporting mechanics account for 43 percent of the hours worked and 47 percent of the wages paid in roadbuilding. Unskilled occupations account for 33 percent of the hours worked and 25 percent of the wages paid.

In terms of hours of work and wages, truck drivers are the largest single occupational group employed on highway construction. Carpenters rank second. Truck drivers account for 12 percent of the time, 11 percent of wages. Thus carpenters account for 7 and 8 percent respectively.

These conclusions were determined from an analysis of payrolls on 3,358 Federal-aid projects of varied types throughout the country. These projects had a total contract value of $2.2 billion. However, the study was based on a short mid-season period—the four-week interval from July 13 to August 9, 1958. More than 17 million man-hours of work were racked up during this period, for which $41,257,904 in wages were paid. The projects were in all stages of construction.

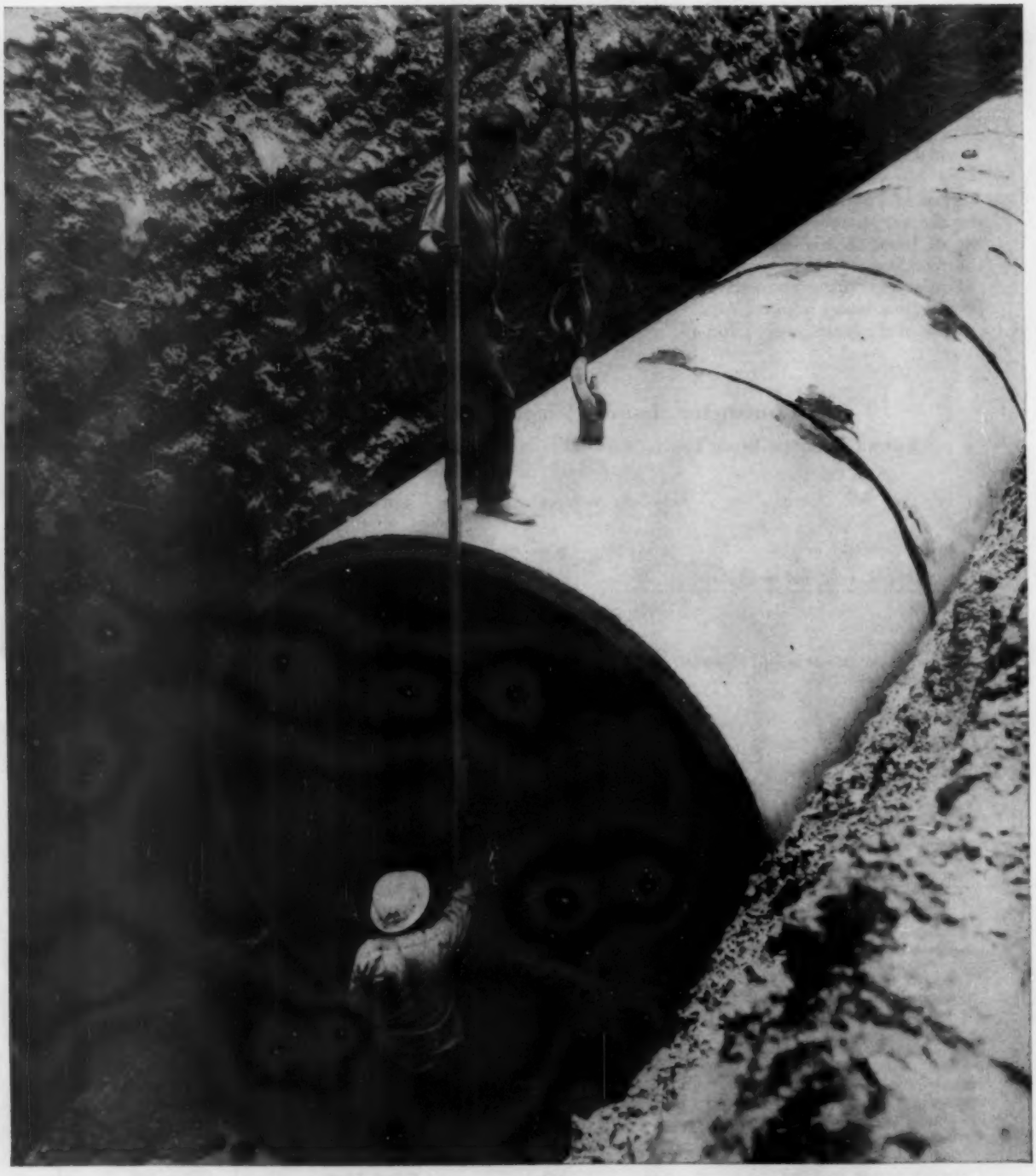
Contractor Labor Usage in Highway Construction

Bureau of Public Roads figures based on reports received from 3,358 active Federal-aid projects; period July 13 to August 9, 1958.

Occupational Group	Percentage Distribution: Hours Worked	Percentage Distribution: Wages
Professional and managerial occupations	*9.40%*	*11.54%*
Foreman	5.98	7.10
Superintendents	2.51	3.29
Civil engineers	0.53	0.68
Managerial and official occupations other than superintendents	0.20	0.27
Surveyors	0.17	0.19
Accountants	0.01	0.01
Clerical occupations	*0.92%*	*0.80%*
Paymasters, payroll clerks and timekeepers	0.60	0.50
Clerks, general office	0.23	0.22
Bookkeepers and cashiers	0.05	0.05
Miscellaneous	0.04	0.03
Service occupations	*0.30%*	*0.20%*
Watchmen, flagmen, and traffic officers	0.29	0.19
Cooks	0.01	0.01
Equipment operators	*37.77%*	*41.02%*
Truck drivers	11.82	10.50
Tractor operators and loaders	5.20	5.85
Motor grader operators	4.14	5.04
Scraper operators	4.07	4.80
Crane, hoist, dragline, and shovel operators	3.98	5.09
Bulldozer operators	3.85	4.57
Roller operators	1.83	1.78
Operators of concrete-mixing and concrete paving machines	0.67	0.67
Operators of asphalt plants and asphalt paving machines	0.49	0.54
Concrete and asphalt finishing machine operators	0.41	0.61
Rock crusher and gravel plant operators	0.40	0.50
Pile driver operators	0.34	0.49
Off-highway hauling equipment operators	0.27	0.27
Subgrading machine, form grader, and stone spreader operators	0.17	0.17
Other construction machinery operators*	0.10	0.12
Apprentices	0.03	0.02
Crafts associated with equipment operation	*5.43%*	*6.13%*
Oilers of machinery	2.38	2.39
Mechanics	2.50	3.07
Firemen	0.23	0.23
Engineers, stationery	0.22	0.30
Pile drivermen	0.10	0.12
Miscellaneous crafts	*13.67%*	*15.54%*
Carpenters	6.55	7.78
Concrete finishers	2.06	2.28
Drillers and mudjack operators	1.05	1.06
Structural steel workers and welders	1.01	1.42
Reinforcing steel workers	0.64	0.75
Metal road form setters and form tamper operators	0.56	0.47
Bituminous paving occupations	0.44	0.42
Pipelayers	0.32	0.27
Blasters and powdermen	0.31	0.33
Painters	0.12	0.15
Chainmen and rodmen (surveying)	0.09	0.07
Electricians	0.08	0.12
Brick and stone masons, and tile setters	0.07	0.09
Apprentices	0.05	0.06
Plumbers	0.04	0.05
Other	0.28	0.23
Unskilled occupations	*32.51%*	*24.77%*
Grand Total	*100.00%*	*100.00%*

*Means not elsewhere classified, includes rig operators, dredge levermen, trenching machine and stabilizer operators.

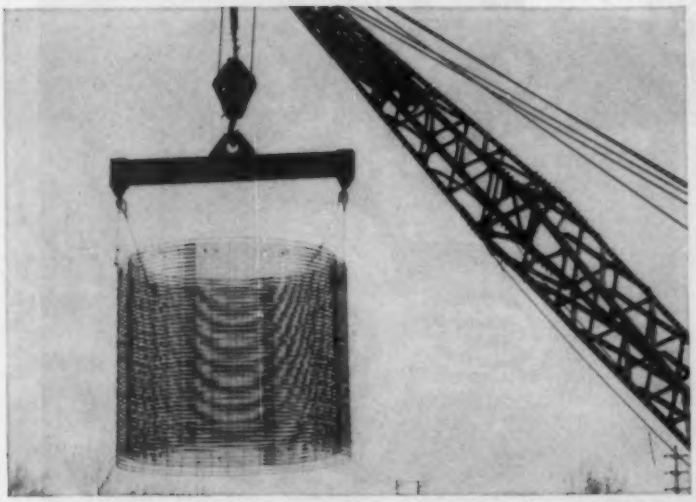
Reinforced Concrete Pipe specified for



The contractor was able to lay 15 to 20 sections of 8-foot pipe in 8-hour work shifts. This rapid progression indicates the exactness of the sections of concrete pipe furnished to the job. The contractor used care in keeping the trench walls vertical and narrow. Since the load-bearing capacity of the pipe is greatly influenced by the width of the trench, this type of installation is desirable and can be accomplished without special labor or equipment.

Visintine & Company and The Complete General Construction Co., Columbus, Ohio—Contractors *Price Brothers, Columbus, Ohio—Pipe Manufacturers*

40-foot depth on Ohio Interstate Highway



The 2 cages of American Welded Wire Fabric are tied together at both the top and bottom with ¾" diameter stirrups. These stirrups increase the ultimate strength of the pipe and resist diagonal tension at top and bottom sections. If the circumferential steel were not accurately spaced, it would be difficult to place the stirrups in the positions required for best performance. This consideration, plus the over-all economy of using readily fabricated American Welded Wire Fabric, led to its selection.

Over-all view of the trench digging and pipe laying operations. You will notice that the 40-foot trench is open cut using a dragline down to the first level and then a back hoe to the 40-foot level. This sequence of operations enabled the trenching operation to proceed very rapidly. The back hoe digging the final trench provided the extremely straight and narrow trench for best installation.

In Columbus, Ohio, work is progressing on one leg of the important new North-South Freeway. 96" dia. reinforced concrete pipe was specified for a 40-foot depth installation. This was included in one of the largest contracts ever let by the state of Ohio.

The state of Ohio special specifications were followed and each phase of the pipe manufacture and installation was inspected by representatives of the state. The pipe was required to withstand 24,000 # per ft. for the 0.01" crack, and 32,000 # per ft. for the ultimate strength. The actual three-edge bearing test results showed the pipe passed these requirements with flying colors. The 0.01" crack did not appear until 26,000 # per ft., and the ultimate was not reached until the load reached 39,200 # per ft.

Produced by Price Brothers, Columbus, Ohio, the 8-foot sections of pipe with an 8½" wall of 5,000-lb. concrete, were constructed with two reinforcing cages of USS American Welded Wire Fabric. The outside cage is style 2" x 8"—0.4375" x 5 gauge and the inside cage is style 2" x 8"—0.505" x 5 gauge. More than 400 stirrups were positioned between the fabric cages for each 8-foot section to increase the resistance to diagonal tension and improve the pipe's ultimate strength.

The production of concrete pipe is closely controlled and numerous tests are conducted to assure design strength. High quality reinforcing steel is an essential ingredient for top-quality pipe. That is why USS American Welded Wire Fabric was chosen to reinforce the concrete pipe for this job. It is machine-made by electrically welding high tensile strength steel wires made to exacting specifications. The guaranteed minimum yield point is 60,000 psi and the guaranteed ultimate strength is 75,000 psi. All members are spaced to the close tolerances of plus or minus ¼" on centers. Because of the accurate machine prefabrication of USS American Welded Wire Fabric the two concentric cages can be formed faster.

Complete technical information on USS American Welded Wire Fabric is available. Just write to American Steel & Wire, Dept. 0118, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

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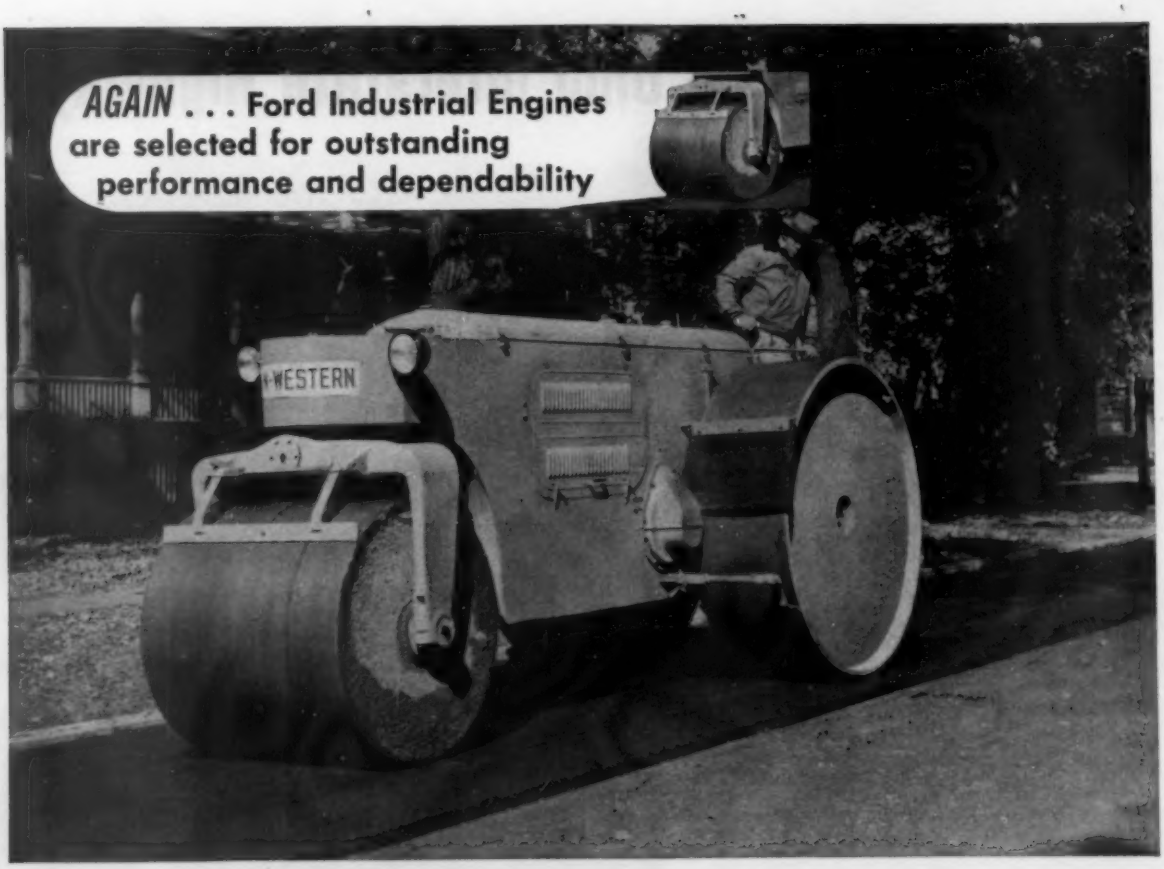


Ford-powered roller provides smooth, steady 14-ton *"squeeze"* for road binding operation!

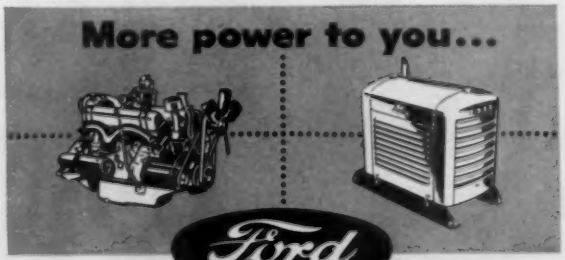
Whatever the material—crushed stone, soil cement, or blacktop—the Ford-powered Austin-Western 3-wheel roller is built to make short work of any compacting job. And just as Ford power contributes to the effectiveness of the Austin-Western roller, a Ford Industrial Engine can bring a new kind of efficiency to your construction equipment.

Ranging from 134 to 534 cubic inches, Ford engines offer a host of modern durability features such as Short Stroke design to reduce friction and wear . . . Deep-Block construction for smoother performance . . . and full length water jackets for better cooling and longer engine life. With features like these, Ford engines now give you *more horsepower per pound of engine weight than ever before possible.*

All Ford engines, including Ford's two highly economical diesels, are available as complete assemblies or power units. Because these engines can be serviced by any nearby Ford Dealer, you can keep downtime to a minimum *wherever you go.*

So to be sure you get the most for your power dollar, specify modern Ford Industrial Engines for your construction application.

FORD POWER IS RIGHT FOR YOUR EQUIPMENT, TOO!



INDUSTRIAL ENGINE DEPARTMENT, FORD DIVISION, FORD MOTOR CO., P.O. BOX 598, DEARBORN, MICH.

West of Rockies write to: → FORD INDUSTRIAL ENGINE DEPT., P.O. BOX 6787, LOS ANGELES 22, CALIF.
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Better Records Made Planning Job Easier

Highway Information File in the Highway Planning Survey Division, Tennessee department of highways. The cabinets house complete records covering 1,100 rural highway and urban street sections in the 5-year plan.

How card system simplified data work and speeded appraisals and priority decisions in Tennessee road program.

By Phillip M. Donnell

Engineer-Director, Highway Planning Survey Division, Tennessee Department of Highways, Nashville

When Tennessee authorities rolled up their sleeves to map a 5-year expanded highway program, the sheer volume of detailed records involved was seen to be a key administrative problem. Records "by the ton" poured in from the state-wide condition surveys, demanding translation for various kinds of action. With 500 projects covering 2,100 miles in the $228 million program, the effort was wisely preceded by a vital job-within-a-job: that of setting up an adequate system of records covering the work needed and accomplished as the program progressed.

The projects selected resulted from the joint efforts of a Highway Study Commission, established by the Tennessee General Assembly in 1953, and the Automotive Safety Foundation, a non-profit organization dedicated to education and research for safe, efficient highway transportation. Deficiencies were noted on all classes of roads and streets, with those on the state system emphasized as the most critical.

With funds and engineers lacking to rebuild the entire state network, the problem became one of selecting road sections most urgently in need of attention. Examination and appraisal of deficient highway sections was, obviously, a study in itself.

This, too, was conducted as a cooperative research project by our Highway Department and the Automotive Safety Foundation. It involved analysis of more than 1,100 rural and urban highway sections and their classification under three criteria-structural condition, facility of movement, and safety—and the establishment of priorities based upon the degree of urgency present.

This led directly to the records which would have to be set up to maintain the voluminous basic data covering the sections of roads to be improved, as well as a running account of work accomplishments, section by section, as the program unfolded. This paper work could bulk large for each of the highway sections. A large form obviously would be required. Several months'

Remington Rand Kardex slide, showing how the highway section cards are filed in their visibly indexed pockets. Overall size of the cards is 11 x 17 in. Folded over, they fit into the pockets.

study led to adoption of Remington Rand's Kardex system, in which individual records are housed flat in pockets contained in shallow drawers, or slides. Under this system we could go to a form as large as 11 x 17 in., folded over for insertion into a file pocket.

Work on form design, and the methods to be used in its maintenance, consumed approximately eight months. The front of the card comprises the Program Control Sheet. At its top, in Section I, is a straight-line diagram containing a scale for logging 10 miles of each of the road or street sections involved. This portion also provides space for recording the street or road name, route number, and its cultural features and boundry lines.

Section II provides space for outlining the geometrics of the applicable road section, mile-by-mile, in direct relation to the scale in the straight-line diagram. Recorded are lane and shoulder width, degree of curve, percentage of grade, and certain traffic statistics, including percentage of trucks, capacity, speed zones, and controls.

Section III covers Surface Life and Dependability Rating, and includes spaces for recording, again mile-by-mile, type and thickness of the surface on the data of survey as well as at the time the road was built and probable year of retirement. Each mile is given a point rating based upon its current conditions, surface, base, subgrade, drainage, etc.

Section IV covers Sight Distance, and is in the form of a graph on which this factor is plotted in terms of miles or fractions of miles. Reported accidents are covered in Section V, recorded mile-by-mile on a fiscal year basis.

Section VI is a Record of Structures existing within the 10-mile road section, and provides space for posting structure number, log miles, type of service, type and material, length in feet, horizontal clearance, vertical clearance, safe loading, and special deficiencies.

Index information, always visible in the bottom edge of the Kardex pocket, includes,—under Road System,—section location (from-to) sheet number, terrain, mileage data, section length, route number, city, county, division, the urgency rating, special warrant, and type of work; then, under Program Year,

Finally, there is Section XV, which consists of the Project Description and Cost Estimates and includes cost and structure summaries, truck climbing lanes, ramps and approaches, and a stop-gap work summary.

As can be seen, this is a healthy amount of data to get in to a single form, but we were able to do it without compromising on space requirements for properly making all necessary entries.

This Highway Information File, of course, is in constant use by our Division Engineers in selecting the most urgent projects, as well as in formulating and carrying out the overall construction program. At the beginning of each fiscal year it serves as the basis for establishing program priorities during the ensuing 12 months. The records are revised and brought up to date every time a contract is completed and, at the beginning of each year, the entire file is subject to any revisions that might be required.

Inasmuch as each card constitutes a combined work-sheet and permanent record—a comprehensive documentation of needs and accomplishments—ready accessibility is of paramount importance. This we get in full measure through the simplicity of the Kardex filing system. Index information is constantly visible, hence needed cards can be located with a minimum of effort and in the shortest possible time.

At present, only the highways project location (from-to), cost per vehicle mile per year, mileage data, type of section, and project length.

The back, or Deficiency Analysis and Program Study side of the card, starts with Section VII detailing truck adjustment for terrain and weighted A.D.T. Section VIII covers average design speed; Section IX, dependability analysis; Section X, speed analysis; and Section XI, accident analysis.

Section XII details deficiencies, while recommended improvement is recorded under Section XIII, and urgency ratings under Section XIV. In addition to these sections, the backside of the form contains space for remarks, and a written outline of the deficiencies that may have been relieved by stop-gap work.

and streets covered by the short-term, five-year program are in the file, but our plans for it include eventually adding every highway in the state, including our portion of the new Interstate System.

Decking and burning timber and debris during clearing, Madonna Construction Co. job, US 40 relocation, California. The Fleco rake on the D8 handled the material into not-too-large piles, while the Rotablast unit with its diesel squirting nozzles and gasoline-engine-driven swiveling fan, secured a fast burn with minimuc smoke even in very wet material.

Rake and Burner Give "1-2" Punch to Clearing Job

The cover scene this month shows one of the segments of reconstruction which is rapidly transforming US 40 into relocated Interstate 80 between Sacramento and the Nevada state line. The state has concentrated funds heavily on this route, which in many places is requiring very heavy grading to thread a four-lane-divided freeway on easy grades and curves through this scenic mountain area.

The job shown is the 5.1-mile segment awarded to Madonna Construction Co., San Luis Obispo, Calif. This firm is handling about two million cubic yards of grading with five Curtiss-Wright CW 230 scrapers with Cummins 300-hp diesel engines, and assorted D8 tractor operated equipment. The latter includes a Ferguson 50-ton compactor, Fleco clearing rakes, and rear-mounted hydraulic rippers. Considerable rock excavation is also scheduled, with the expectation of completing grading, bridges and paving in 1960 under a 250-day time limit.

Shown here, supplementing the front cover, are the Fleco rake and a John Bean Rotablast which, together, decked and burned roots and other clearing debris at a remarkably rapid rate.

IN MODERN CRAWLER DESIGN

With over twenty-five years of experience in building heavy earth-moving equipment exclusively, Euclid offers a greater range of types and capacities, a greater background of field experience, and a greater return on your equipment investment.

One example of this greater dimension was the introduction of the Model TC-12 Crawler over 5 years ago. Here was an entirely new concept of tractor design . . . two engines, each driving a separate track through its own Torqmatic Drive . . . unequalled power and work-ability . . . performance that set a new standard of crawler productivity . . . ease of operation and servicing that is still unsurpassed in the industry.

Recently the Model C-6 Euclid tractor went into production after the most comprehensive field trials and proving ground testing ever given any new Euclid model. It, too, has Torqmatic Drive and full-power shift as well as many of the advanced design features of the bigger TC-12. And like the "Twin", the new C-6 utilizes major components that have been job proved in thousands of "Eucs" in construction, mine and quarry service. For instance, the Allison converter and semi-automatic transmission "package" has long since passed the pioneering and development stage . . . it's been used in "Euc" scrapers, rear-dump haulers and other models for years. These two Euclid crawlers provide so much more work-ability that they obsolete tractors without the operating advantages of full-power shift.

EUCLID Division of General Motors • Cleveland 17, Ohio

EUCLID'S GREATER DIMENSION

Dependable GM 6-71 engine delivers 211 net h.p. to power train . . . proven Torqmatic Drive provides full-power shift and fast response . . . almost unbelievable ease of handling . . . fast-as-a-fox maneuverability . . . fine visibility . . . exceptional balance with heavy duty attachments . . . accessibility for servicing that results in more productive time on the job.

The C-6 has the speed, power and maneuverability to handle every kind of tractor job . . . ripping, dozing, push loading, clearing, towing and other heavy work. Many major components including Torqmatic Drive, engine, and planetary drive axle have been job proved in thousands of Euclid earth-movers. Owners say that full-power shift, easy operation and fast response give the C-6 more work-ability than any other crawler in the 200 h.p. class.

Facts and figures on the Model C-6 and Model TC-12 "Eucs" are available from the Euclid dealer in your area . . . get in touch with him soon!

Greater Dimension in power and performance . . . TC-12 has 2 engines that deliver a total of 425 net h.p. . . . independent track drive with separate power train and Torqmatic Drive for each track . . . full-power shift and instantaneous reverse . . . 8 track rollers . . . unequalled accessibility for servicing . . . maneuverability and workability that have set new standards of big tractor performance.

Proven Torqmatic Drives deliver a smooth flow of power to each track . . . with full-power shift there's no delay for clutching and shifting . . . change direction with a flick of the wrist . . . 425 total net h.p. is automatically matched to every job requirement . . . rigid track alignment maintained by independently suspended track frames and final drives . . . years-ahead engineering reduces downtime and maintenance costs for a better return on investment.

Crawlers without full-power shift are obsolete . . . and costly!

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

. . . for more details circle 316 on enclosed return postal card

Dozers Backfill Swamp Under Water

By W. F. Land

Design Engineer, Alabama State Highway Department, Birmingham, Ala.

A route around the west side of the City of Mobile, Alabama, was proposed for construction at the time of passage of the Federal Aid Highway Act of 1956. The route traversed an area known as Wragg Swamp which is an undeveloped residential areas to the east and west. Upon selection of the Interstate Highway System it was decided to incorporate the location of the Belt Line into Interstate Route 65, as the location was deemed suitable traffic-wise as well as respecting the area's cultural and physical aspects. Plans for the road, known locally as the "Mobile Belt Line," were being developed for a four-lane divided section with gradients only far enough above the existing ground to insure surface drainage, prior to inclusion in the Interstate System.

The engineering firm of J. B. Converse and Company of Mobile had previously been retained by the County of Mobile for preparation of plans on the old Belt Line. The state entered into agreement with this firm for preparation of the Interstate Highway plans.

The construction of a highway facility to Interstate standards through the Wragg Swamp area posed several problems. Wragg Swamp area generally consists of organic muck from 2 to 16 ft. deep, overlying a firm stratum of fine sand which in turn overlies a considerable depth of marine clay. After soils investigation and subsurface analysis, it was decided that the organic muck would have to be removed, to insure a stable roadbed including several fills up to 20 ft. above the ground surface.

Also the problem of securing suitable material for backfilling the muck excavation within reasonable haul limits posed some problems.

Fortunately borrow areas were located in close proximity to the project, which contained all elements of the several types of borrow material needed for the construction. Sufficient free-draining sand was available in the designated borrow sources for underwater backfill; also enough sand-clay for above water fills, and of materials meeting granular soil base course requirements. There was considerable ground water and need for surface drainage of water entering the Wragg Swamp area, hence the only practical method for replacing the muck excavation was deemed to be a backfill of sandy material deposited under water.

The design for the typical section consisted of two 24-ft. through travel lanes with 10-ft. outer shoulders and a 54-ft. depressed median. Also included in the typical section are frontage road along both sides, surfaced 22 ft. wide and separated from through lane pavement by a 51 ft. outer depressed separator.

The plans call for the removal of the organic muck material down to firm strata, to a point where perpendicular line intersects the natural ground line and the slope of the fill construction. In general the through lanes are profiled about from 1 to 2 ft. above the frontage road grades; with the exception, of course, where such lanes make an overpass with existing highways and streets.

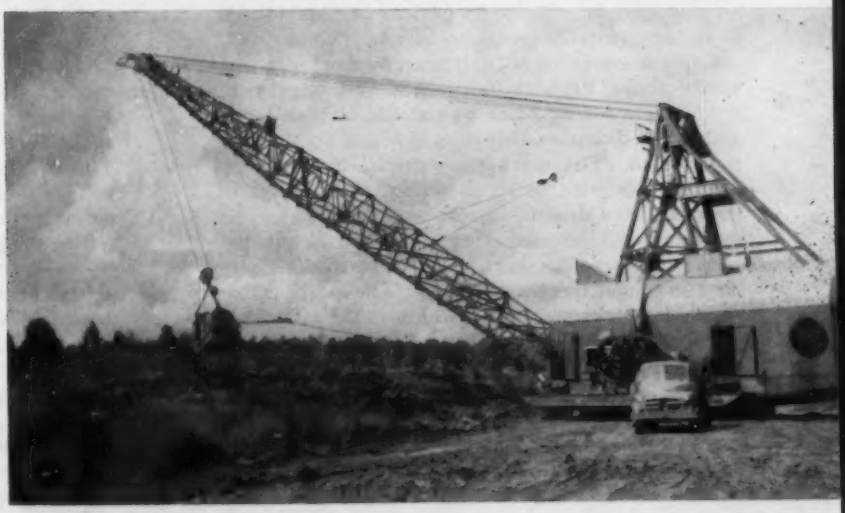
Foundation investigations indicated that considerable fill settlement could be expected on the Interstate fills for the interchange with US 90 and at the separation with Cottage Hill and Pleasant Valley roads. This expected settlement was due to the depth relationship encountered with marine clays at these locations. The design called for the addition of surcharge on these fill sections to a height of 6 ft. to accelerate the settlement. Settlement plates were provided in the design, in order that accurate measurements could be made periodically and a time settlement curve could be plotted. These settlement plates were placed in various components of the surcharge fill and ramps, and will be part of a long range research problem in fill settlement.

The plans were designed for an initial construction contract for grading and minor drainage. Contract for the 3.2-mile project was awarded on low bid to Blount Brothers Construction Co. of Montgomery, Alabama, in November, 1958. The unit price bid for 917,000 cu. yd. of muck removal, was 85c per cu. yd. For underwater backfill the price was 52c for 1,315,000 cu. yd. Overhaul for the latter item was bid at 2c per 1,000 ft.

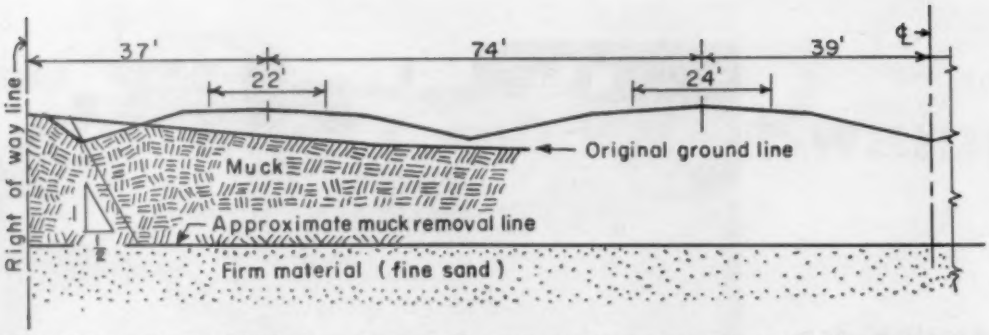
In accordance with the special provisions the re-

Dozers leveled sand backfill brought in by scrapers, in lieu of pumping of sand. Skillful dozer work helped in displacing muck left by the draglines.

One of the borrow sources for underwater backfill and embankment material for the project. 2,000,000 cu. yd. will come from this area.



Walking dragline (Bucyrus-Monaghan) worked with Northwest crawler-mounted draglines to do the swamp excavating and sidecasting to the spoil bank.



Main highway entering Mobile from the west will consist of twin express roadways with frontage roads across Wragg Swamp.

moval of muck could be executed either by hydraulic dredge, bucket dredge or dragline excavators. Disposal areas for muck excavation were designated at most convenient points adjacent to the right-of-way.

The contractor elected to use dragline equipment for the muck. He brought in four 3-yd and one large Monaghan dragline on which both 6 and 7½ cu. yd. buckets have been used. In his construction procedure the proposed point of entry from the borrow sources was the starting point of the mucking operation. The contractor removed muck on the frontage road adjacent to the borrow source, using a 3-yd. dragline on mats, working away from the source of borrow and backfilling with the sand for the under-water embankment as he progressed.

This method of operation, with establishment of a firm frontage road provided a stable platform from which to operate the larger dragline. Using the smaller dragline lateral ditches were opened which could be plugged at the contractor's convenience to provide water to correct elevation during the underwater backfilling operation. There has been sufficient surface water for this purpose throughout job. This circumstance has given the contractor complete control in establishing pond level to inundate the sandy underwater backfill, in accordance with the specifications and requirements.

Using frontage roads established by methods mentioned above, the areas between the frontage road is being cleared of muck by the use of both large and small draglines. Muck is side-cast to the disposal areas. The muck encountered in the large interchanges must be recast several times to reach the designated disposal areas.

The contractor's operation in the borrow pits involves the use of scrapers, predominantly Caterpillar DW21 and the Euclid TS-18. The sandy material for underwater backfill lies low in the pit, much of it being below natural ground water. To insure the effectiveness of the scrapers for moving the borrow as long as possible, the contractor has dewatered the material pit with sump pumps. The granular material for underwater backfill is of such nature that the contractor can carry on a continuous operation during medium and light rains.

Progress on the project as a whole has been "on time" and the stability of the fills constructed have been very encouraging. One of the surcharge fills has reached the point on the time settlement curve where negligible settlement can be expected in the future. The surcharges were constructed on high quality sand-clay from the borrow areas and will be used for topping out adjacent fill areas when the surcharges are removed.

It would appear that the type of construction used for the particular earth problems is very satisfactory, and a stable finished product can be expected with a minimum of differential settlement.

PLANNING YOUR FUEL SUPPLY

Continued from page 132

your project is a large one. He will be more cooperative and anxious to serve your needs if you make it easy for him to deliver fuel to your project.

A common situation is where your job tank or fueling location is say 300 ft. off the highway, and your supplier must take a $15,000 tanker through a cornfield or over a rough rocky trail to deliver perhaps $50 worth of fuel. His profits for the entire job could be lost by one ruined tire or one bogging down. A few truckloads of crushed stone or gravel, and a little dozer or blade work will help get your fuel in and make the supplier more cooperative.

If your highway earthmoving job is an average one, it will take say 20,000 to 70,000 gallons of fuel. The local agent or distributor will probably charge about 3 cents a gallon more to service the job direct. This cost may be more than offset by the saving to you in tanks, pumps and handling labor. It's a point worth comparing when you plan your job.

The supplier may not want to service your machines direct. But he may agree to do so at a reasonable price if your foreman agrees to line up the machines "along a good travel path", at stated hours, for refueling most of all units at one time. Then only a small emergency tank on your repair or lube truck is needed to make out in emergencies.

The best deal can be gotten from a supplier when your crew and his have built up a good working relationship, and can plan the delivery together—how much per day, delivered where.

THIN TREMIE SEAL

Continued from page 148

Once the braces went in, excavation became a teaspoon operation. The cranes switched to clamshell buckets to get between braces and close to walls. Carefully controlled blasting loosened lenses of tough coral for easier removal. And air-lifts made quick work of rock and silt clean-up. Thorington built several air-lifts in different sizes (using 7-, 8-, and 14-in.-diameter pipe). A crane picks up the air-lift by built-in lifting eyes.

The crane operator feels his way along, and when he's on bottom, a bank of Ingersoll-Rand compressors delivers air to the base of the lift, carrying along water, rock, sand—they all gush through the pipe and over the cofferdam wall. All the while, survey crews take soundings to control the depth of cut within close limits.

Wall Tie-Backs. The north cofferdam currently under construction promises to be much simpler to get into than its south counterpart. Thorington has done away with most internal bracing by grouting tie-back rods into the rock and sand behind the sheet pile wall. Set at a 1 to 1 slope, the tie-backs bolt into a waler located near the top of the sheeting. The rods are 60 ft. long and 3 ft. apart.

Representing Thorington Construction Co., Inc., is James E. Hood, project manager; George Poland, project engineer, and Harold Guppy, superintendent. Engineers are Singstad & Baille, New York, and the owner is the Florida state road department.

Massachusetts Bond Program Unopposed

A billion-dollar, four-year state highway construction program advocated by Governor Furcolo and public works commissioner DiNatale found no opposition at a recent legislative committee hearing.

The program calls for $238 million of 20-year bonds; $298 million in 10-year notes, with the principal to be paid off from anticipated federal aid; and another $340 million in staggered issues of 20-year bonds for annual refinancing of state highway debt. Construction of 500 miles of new highways would be provided.

your nearby

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SOUTH DAKOTA—Sheehan-Bartling, Inc., Rapid City-Sioux Falls

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WASHINGTON—Air Mac, Inc., Seattle • Intermountain Equipment Co., Spokane

WEST VIRGINIA—Machinery, Inc., Charleston

WISCONSIN—Hunter Machinery Co., Inc., Milwaukee-Green Bay

Eugene Barton, president (left), and Ed Krueger, superintendent, of Barton Contracting Company. Mr. Barton started in business as a sand and gravel producer and then went on to solidly establish himself in road paving. He commented on his Rex Concrete Paving Spread, "We are well satisfied with the speed it gave us on our first job. We completed the slab in 50% of allotted time—*that's paving!*"

LEADERSHIP IN ACTION

Two Rex Pavers teamed up for this strict specification job with a Rex Spreader, Rex Finisher and Rex Float following the placing operation. This was a fully coordinated job with Rex batching equipment also used.

Another Outstanding

"We completed the slab in 50% of allotted time—that's paving!"

Ninety working days and rigid requirements were set for this 7.3-mile concrete highway job near Minneapolis.

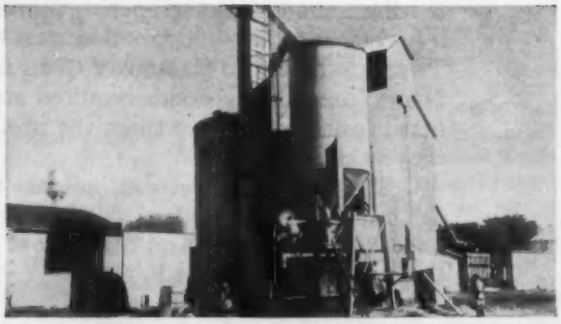
Barton Contracting Company, Osseo, Minnesota, got the contract, and then went on to cut the concrete paving time to just 48 days. Here's how they did it:

To supply the required 194,000 square yards of concrete for slab 24′ wide by 9″ thick, Barton set up new Rex Cement and Aggregate Batch Plants. Barton's Rex Spread included two Rex 34 E Pavers, Rex Spreader, Rex Finisher and Rex Longitudinal Float, which easily produced the yardage required to meet the contractor's demands as well as the specifying agency as to mixture, surface tolerances, etc.

Barton's success is based on using the newest, most productive equipment —and ideas. For example, their Rex Batching Plants are completely automatic—with just one man operation at each location to give accurate batches everytime.

Rex Paving Performance

Located about four miles from the cement batcher, the Rex Aggregate Plant with twin aggregate weighing batchers loaded trucks in approximately 80 seconds for five batches. Panel tells operator by schematic lights exactly what is occurring at any moment through entire batching cycle.



The Rex Cement Plant has bin capacity of 400 bbl. (with 600-bbl. reserve storage) and batches 5-compartment trucks in about 65 seconds. Rex-O-Matic push-button controls give accurate measurement.

Upgrade your paving equipment for maximum profits in road and airport work. Talk to your Rex Distributor (listed at left) or write for illustrated catalogs on the complete Rex line of concrete paving equipment. Also ask for the complete report on the Barton job with interesting facts and photos. CHAIN Belt Company, 4652 W. Greenfield Ave., Milwaukee 1, Wis. In Canada, CHAIN Belt (Canada) Ltd., 1181 Sheppard Ave. East, Toronto, Ontario.

REX®

CONSTRUCTION MACHINERY

. . . for more details circle 300 on enclosed return postal card

Court Decisions

Tangled Responsibility

A fatal accident, resulting in the death of the operator of a tractor on a highway construction job in Maryland, was the genesis of a lawsuit which provided the Maryland Court of Appeals with a tangled web of responsibility to unravel. The tractor was owned by a construction company but had been loaned to the highway contractor who was doing the job. At the time the accident happened it was pulling a roller owned by the highway contractor.

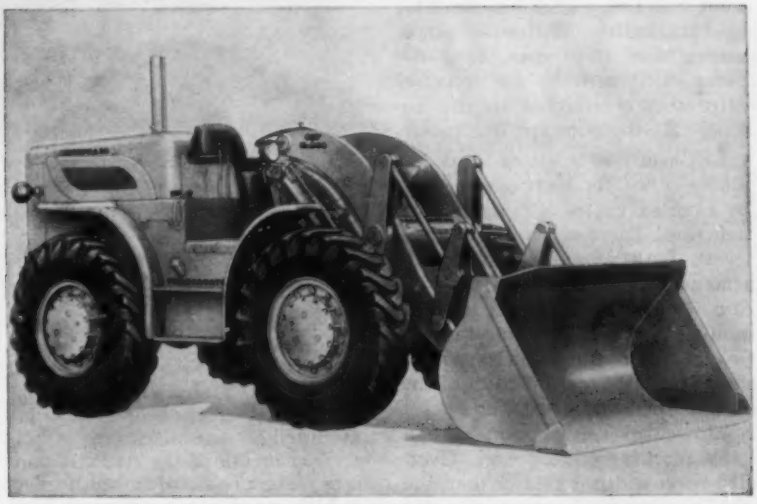
The operator who was killed was employed by the construction company which owned the tractor, but he was under the direction of the highway contractor's foreman. However, he was paid by the tractor owner; the highway contractor, if dissatisfied with his work, could not discharge him, but could only ask the tractor owner to replace him with another of its employees. The tractor had been lent to the highway contractor because he had previously lent a loader to the tractor owner and the debt was being thus repaid. The tractor owner paid the operator who was killed and deducted Social Security and other taxes from his pay.

The question at issue was, who would be responsible for the payments of death benefits? The Maryland Workmen's Compensation held that the tractor owner and its insurer were solely liable. The Circuit Court upheld that decision and the tractor owner appealed to the Court of Appeals, contending that the highway contractor under whose direction the actual work was being done should share the responsibility for the payments. The Court of Appeals after a thorough review of the complicated situation affirmed the judgment of the lower court, pointing out that, although both the tractor owner and the highway contractor had control over the operator's work, the tractor owner had the greater control and so should be regarded as the sole employer responsible for the payment of death benefits.

(L. & S. Construction Company v. State Accident Fund, 155 A.2d 653.)

NEW PRODUCTS

Listed here are reviews of new and improved equipment items, selected to aid our readers in purchasing. See reader service numbers on enclosed postcard.*



Caterpillar's New Wheeled Traxcavator

Wheeled Traxcavator Makes Bow

Major features and product details of the Cat. No. 944 Traxcavator have been announced by Caterpillar Tractor Co.

Most apparent change of the machine in this new wheeled version is the location of all lift arms and hydraulic cylinders ahead of the operator's compartment.

Powered by either a gasoline or diesel engine, the No. 944 has a 2 cu. yd. capacity bucket as standard equipment. Both engines are rated at 105 net hp. Maximum rating of the D330 diesel engine is 135 hp. A power shift transmission is standard. Dumping reach of the unit is 31.75 in. at maximum height (9′ 2″). The bucket is provided with a tip back angle of 41 deg. at ground level; tip back at maximum lift is 50 deg. Automatic bucket positioner and lift kickout are standard hydraulically-operated equipment.

The unit's torque converter and power shift transmission provide positive response necessary in wheel loader operation, the maker states. Power train of the unit includes the power shift transmission which is a two-speed forward, two-speed reverse planetary transmission. It consists of four in-line gear trains, each with a separate clutch. Two of the planetary trains provide direction control, the other two gear speed selection. The power train also includes a manually shifted range selector transmission affording a 4-wheel drive work range or a 2-wheel drive travel range. A hydraulic safety valve in the transmission control unit automatically shifts the transmission into neutral, should oil pressure drop or the tractor be shut down.

Control of machine direction and speed is afforded by two control levers. Two air boosted foot brake pedals are suspended from the compartment forward wall to retain clean deck area. The right brake acts as a conventional brake pedal, and the left brake contains a neutralizer valve, which shifts the transmission's directional control into neutral when more than 40 psi brake pressure is applied. Steering system is hydraulically boosted, axle oscillation of the steered wheels is accomplished by use of a center point system with oscillation pivoting on the center of the axle.

Control of the loader is performed by a newly-designed control

*To readers outside of the United States—postal rules forbid use of business reply cards outside of the U.S. Please write to us listing the numbers, month and name of magazine, and mail with your name and address to Inquiry Dept., Roads and Streets, 22 W. Maple St., Chicago 10, Ill., U.S.A.

system; the system is entirely closed, and all hydraulic fluid is full-flow filtered. The loader hydraulic arrangement is built on a modified series circuit. Operationally, this is reported to result in optimum ease of loader manipulation. During the loading cycle, when both lift and tilt cycles are used simultaneously, their design gives priority to the tilt control allowing for the most efficient interaction of the controls for bucket loading. Hydraulic power comes from a 40 gpm, vane-type pump, driven from an accessory drive direct-connected to the engine, insuring constant live power.

Lift arms are made of solid 2-in plate, joined for increased rigidity by a cross member of box-type construction. There are two bell crank levers, both mounted on the lift arms and both of cast steel construction. The forward lever is straddle mounted on the lift arms, and has two snubber stops which provide sharp, solid shake out action of the bucket when dumping. The bucket is of welded construction with a self-sharpening cutting edge. Overall bucket width is greater than the machine, serving as a protection for the tires when the machine is used in such applications as shearing banks or cleaning gutters.

Ease of servicing is a feature of the new loader: Routine servicing of the engine can be performed by hand-removal of engine side panels; rigid protective fenders serve as working platforms. Front guard consists of seven bolt-on pieces which are easily removed from servicing the lift cylinders, hydraulic manifolds and brake master cylinder. In the operator's compartment, the seat can be tipped forward for access to the transmission filter, control valve load pump and control linkage adjustment.

Attachments include side dump buckets with 2 cu. yd. capacity; a light material bucket, capacity 3 cu. yd., 2 yd. quarry buckets; fiberglass cab and a lumber fork with adjustable tines.

Caterpillar Tractor Company, Peoria, Ill.

For more details circle 101 on Enclosed Return Postal Card.

Vertical Boom Ditcher

Originally designed for the U. S. Army Corp of Engineers, the Barber-Greene Model 750 Ditcher is

Barber-Greene Model 750 Now For Civilian Use.

now available for purchase by civilian users.

The unit is a high speed, heavy duty, pneumatic tired vertical boom machine, digging up to 2 ft. wide and 6 ft. deep. The unit is capable of over-the-road travel at speeds of 27 mph. The diesel powered model weighs 36,000 lb. and is mounted on pneumatic tires. Operating principle of the vertical boom is to move a chain of linked buckets at high speed, cutting through hard material with an action similar to a milling machine working in metal. Each bucket is designed to be self-cleaning, which is said to make it efficient in sticky mud. An all hydraulic drive provides an infinite range of forward speeds from zero to 20 fpm.

Barber-Greene Company, 400 N. Highland, Aurora, Ill.

For more details circle 102 on Enclosed Return Postal Card.

Low-Bed Trailer

International Harvester Company has introduced a four-wheel, low-bed trailer.

With 9,500 lb. capacity and shock absorber wheel suspension, the unit is called the No. 95. Rubber-mounted torsion axle which acts as a combination spring and shock absorber, works equally well whether vehicle is empty or loaded, the maker states. Independent oscillation of each wheel enables smooth movement of the trailer when pulled over rough terrain or at normal highway speeds. Single unit, welded angle steel frame gives stability to trailer bed which is of 2 in. thick unfinished wood. Tailgate serves as a one-man ramp for fast unloading. Overall width of the truck is 8 ft., length, 19 ft.; bed width, 76¾ in.; bed length, 14 ft. Basic machine weight, 1,600 lb.

Consumer Relations Dept., International Harvester Company, 180 N. Michigan Ave., Chicago 1, Illinois

For more details circle 103 on Enclosed Return Postal Card.

Primary, Secondary Gravel Plant

A new, portable single unit pri-

I. H. No. 95 Low Bed.

Universal Gravelking Primary, Secondary Plant

mary and secondary gravel plant featuring increased primary capacities with a matched jaw crusher has been introduced by Universal Engineering Corporation.

The Gravelking can produce in excess of 700 tph of 1 in. minus material on the job. It is designed to produce four grades of material through a process of "systemized screening" and crushing. These grades include pit run sand, pit run gravel, 100 percent crushed gravel and crusher dust, and combinations of the three. The unit features a 13 in. by 36 in. matched jaw crusher, a 4 ft. by 12 ft. 2 x 2/3 deck inclined gyrating scalping screen, and a 4 ft. by 12 ft. 2½ deck final sizing screen. The plant is available with triple axle running gear to reduce axle load. Scalping screen and matched jaw crusher are individually mounted.

Universal Engineering Corporation, Cedar Rapids, Iowa

For more details circle 104 on Enclosed Return Postal Card.

Truck Cranes, Shovels

For the 1960 market, "Quick Way" Truck Shovel Company has announced eight carrier mounted cranes and shovels with front end attachments.

The new models are of three groups: 12½, 10 and 8½ ton; 20, 18 and 15 ton; 25 and 22½ ton. Each group incorporates latest designs in structures and carriers for balance and center of gravity. A feature of the new line is in the method used to develop specific ratings for each model. With the exception of carriers, engines, counterweights and variations in application of single or tandem hook rollers, with or without anti-friction bearings, all models in each family group have the same heavy duty upper-works as used in the highest rated capacity group. There is a "Quick Way" Carrier for each of the new models, matched to give

"Quick Way" Model 180B

maximum stability for all types of operation. Either 6 x 4 or 6 x 6 drive may be used.

"Quick Way" Truck Shovel Company, P. O. Box 1800, Denver, Colo.

For more details circle 105 on Enclosed Return Postal Card.

New Motor Grader Series

Huber-Warco Company has made available a new series of standard transmission motor graders designated as models 8-D, 9-D, 10-D and 11-D.

A greater selection of diesel engines and horsepower is available in the new series. The 8-D is powered by an International UD-370 which develops 83-hp. Three 100 hp engines are available in the 9-D: the International UD-14A, the General Motors 3-71 and the Cummins J-6-BI. Power for the 10-D can be supplied by either an International UD-554, a General Motors 4-71 or a Cummins NHC-4-BI. Each develops 125 hp. The 11-D is powered by a Cummins H-6-BI which develops 160 hp. Constant mesh transmission features six speeds forward and reverse as standard in all models. Optional creeper gears give three additional speeds in both forward and reverse. Turning radius of the new graders has been reduced by 4 ft.

Huber-Warco Company, Marion, Ohio

For more details circle 106 on Enclosed Return Postal Card.

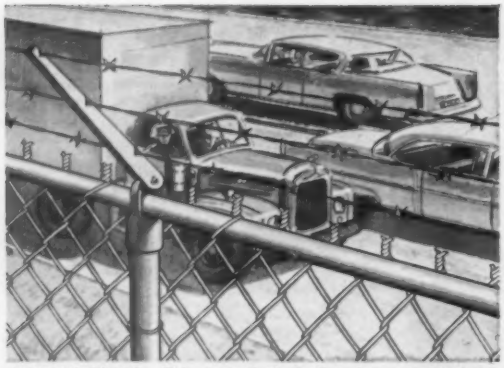
Reproduction Unit

The new Streamliner 100 for the reproduction of engineering and architectural drawings, has been introduced by the Ozalid Division of General Aniline and Film Corporation.

The SL-100 accommodates materials up to 30 in. in width with a synchronized printing and developing speed of 14 fpm. Positive gravity ammonia feed eliminates the possibility of vapor lock, the manufacturer states. Other new features include stacking tray for originals up to 11 in. long; front stacking of prints up to 12 in. x 30 in. with alternate rear print stacking of 24 in. x 30 in. A large feedboard 4 in. x 45-½ in. allows stacking of cut sheets. The highly efficient cooling system provides a printing cylinder 10 deg. to 20 deg.

Continued on page 170

Motor Grader from Huber-Warco's New Series

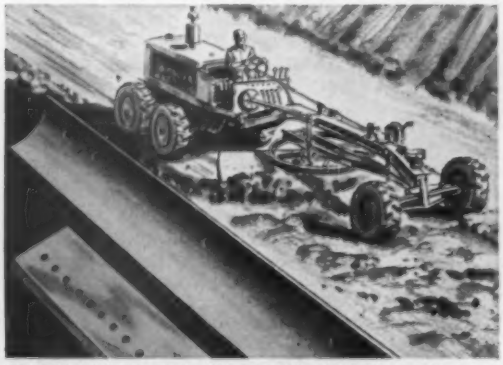


REALOCK FENCE – This rugged chain link fence is ideal for job-site protection of tools, equipment and materials. Also recommended for right-of-way installations. Available in galvanized steel or aluminum.

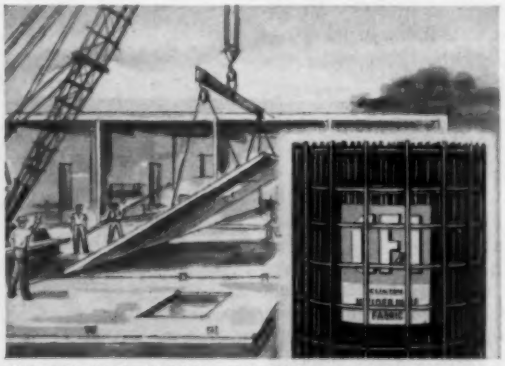
You have helped better Steel

Through the years, CF&I engineers and field men have talked with contractors on countless job sites across the country. Their objective: to gain a thorough insight into all types of construction problems, and discover how CF&I steel products could be improved to help solve these problems.

Construction men have been most cooperative—perhaps you were one of them. They told us what they

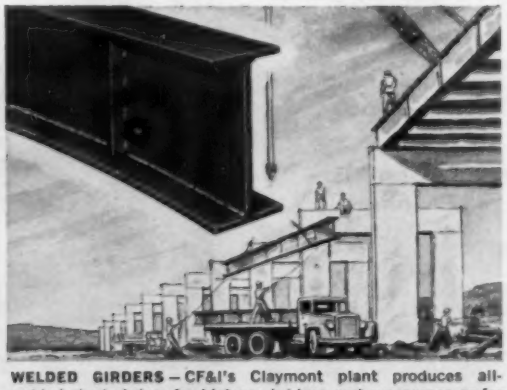


GRADER BLADES – Scientifically designed and carefully manufactured, CF&I Blades and other cutting edges are tough and durable. Available in hundreds of different lengths, widths, thicknesses and hole spacings.



WELDED WIRE FABRIC – CF&I-Clinton Welded Wire Fabric speeds construction of precast concrete sections because it can be easily cut and installed. Steel mesh increases the strength of the concrete unit and helps prevent small cracks from expanding.

STEEL STRAND – CF&I Strand is manufactured in accordance with ASTM Specification A-122 for long-lasting guying applications. Carefully galvanized, CF&I Strand resists weather and other corrosive elements.



WELDED GIRDERS – CF&I's Claymont plant produces all-welded steel girders for highway bridges and overpasses or for rigid frame building construction. Claymont's ideal location near major rail, water and highway arteries ensures prompt delivery.

For complete information on all products, ask for Catalog G-104, "CF&I Steel Products for the Construction Industry."

THE COLORADO FUEL AND IRON CORPORATION

DENVER • OAKLAND • NEW YORK

7472

us make Construction Products

needed, and we have met the challenge with modern steel construction products.

Some of CF&I's steel products for construction use are shown on these pages. All have *dependability* built into them—an intangible quality symbolized by our Corporate Image. You can rely on these steel products to help you handle all types of construction jobs safely, efficiently and profitably.

SPACE SCREENS – CF&I makes a wide range of space screens; you can select the type that gives the specific results you need—accurate sizing, rapid screening, maximum resistance to destructive factors, or an optimum combination of these desirable features.

. . . for more details circle 299 on enclosed return postal card

New Products

Continued from page 167

Ozalid Streamliner 100

cooler than previous models. This is said to permit processing plastic coated materials, foils and photographic film without adherence to the cylinder. Both cylinder and lamp are immediately accessible for servicing and cleaning.

Antara Diazo Division of General Aniline & Film Corporation, 435 Hudson St., New York 14, N. Y.

For more details circle 107 on Enclosed Return Postal Card.

Hydraulic Package

A subframe and equipment hydraulic package is now available to mount the new Ford "Super-Duty" loader on Fordson Major Diesel and Fordson Power Major tractors.

This subframe and equipment hydraulic package enables the user to mount any combination of a Ford Super-Duty" loader, backhoe or counterweight boxes on this tractor. The loader has a lift capacity of 2,500 lb. and a breakaway capacity of 5,500 lb. and can lift a capacity load to a height of over 11 ft. Also, it can fill any standard size dump truck from one side of the vehicle, the manufacturer states. Power for the loader comes from the independent "universal" hydraulic power package. Buckets can be obtained with capacities of ⅝ and ¾ yd. A light material bucket is available with a capacity of a full yard.

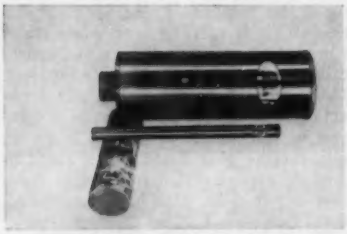
Tractor and Implement Division, Ford Motor Company, Birmingham, Mich.

For more details circle 108 on Enclosed Return Postal Card.

Diamond Bits

Development of a new line of tubular Thin Wall Diamond Bits for holing through materials such as reinforced concrete has been announced by J. K. Smit & Sons, Inc.

Principal applications for the bits include running pipe and wiring through masonry, core sampling of reinforced concrete and similar uses. The bits are made in standard diameters



Smit Thin Wall Bits

from 1/14 in. to 14 in. and in 4½-in., 12-in. and 18-in. core lengths. Larger diameters and core lengths are made to individual specification. The bits are produced in three types: 1) Whole diamond first quality resettable, 2) Impregnated, with cutting diamond particles in a tough bonded matrix, and 3) Whole diamond second quality throwaway bits. Adaptors are supplied without extra charge on bits in diameters up to and including 6¼ in.

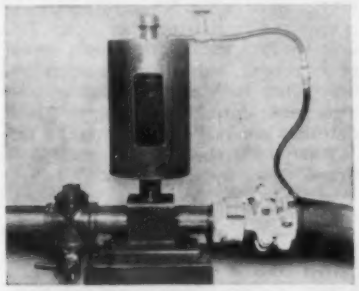
J. K. Smit & Sons, Inc., Murray Hill, N. J.

For more details circle 109 on Enclosed Return Postal Card.

Hammer Lube System

A pile hammer lubrication method known as the Dualtube System which is said to offer good pile hammer lubrication, plus increased pile driver hose life has been developed by the McKiernan-Terry Corp.

The major differences between this system and usual methods of pile hammer lubrication are that lubricating oil never contacts the lining of the steam hose but is carried to the hammer through a separate oil tube in the hose and is force-fed by a positive displacement equipped with a low oil warning whistle.



M-T Dualtube System

Pile Hammer Division, McKiernan-Terry Corp., Dover, N. J.

For more details circle 110 on Enclosed Return Postal Card.

Steel Cutter

A new, low-cost, portable machine which cuts steel bars up to 2 in. in diameter has been introduced by Tidelands Equipment Company.

The new machine, called the Hallto Bar Cropper, is manufactured in Sweden and cuts steel and other metals hydraulically. With slight pressure on a lever activating the unit, it delivers up to 90 tons of cutting power, producing a smooth, safe cut, the producer states. It cuts bars, flats, and, by using a special set of blades, it also can cut angle irons. The unit can operate either on gasoline or electricity, and can perform up to 22 cuts per minute. The machine is reported capable of cutting up to five ⅝-in. bars at the same time.

Tidelands Equipment Company, 3625 Westheimer, Houston 27, Texas

For more details circle 111 on Enclosed Return Postal Card.

Demolition Tool

A newly designed demolition tool has been developed by Chicago Pneumatic.

Designated the CP-124, this 80-lb. class Demo incorporates small overall length, which is said to give good balance and riding qualities. It also has a body-contoured back-head and rubber-cushioned shock-resistant retainer. Other features include: four sturdy

CP-124 Demo.

bolts assuring leakproof backhead fit as well as reinforced muscle power when tool is used to pry shattered concrete. A check-valve type oil regulating pin seals off chamber the instant piston steps. Also a large diameter, fast-acting piston that complements a responsive valve. Extra large fronthead springs absorb the shock of heavy-duty demolition.

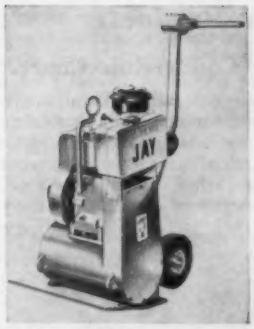
Chicago Pneumatic Tool Company, 6 E. 44th St., New York 17, N. Y.

For more details circle 112 on Enclosed Return Postal Card.

Improved Tamper

Tamping force has been increased as much as 50 percent in the 1960 line of Jay Tampers, announces the manufacturer, J. Leukart Machine Co., Inc.

Increased tamping force as well as increased travel speed makes it possible to compact as much as 100 cu. yd. of earth per hr. in 6 in. lifts when using this compact tamper. In addition, a new plate contour is said to assure better, faster tamping in heavy soil.



Improved Jay Tamper

Mechanical improvements include larger oil bath air cleaners and new air cleaner mountings of solid, cast aluminum that are bolted rather than clamped. Three models provide 13 in. to 36 in. tamping width and are equipped with 4-cycle Wisconsin Model BKN engines of 6.8 hp at 3,600 rpm.

J. Leukart Machine Co., Inc. Columbus, Ohio

For more details circle 113 on Enclosed Return Postal Card.

Double Duty Rake

A new and improved York rake, Model RE, for use with 3-point hitch tractors, has been announced by York Modern Corporation. A major advantage in the new model is said to be the front-or-rear caster wheel mounting. Brackets are designed to permit caster wheels to be mounted either ahead of

Rumrill York Rake

or behind the rake teeth. Rear mounting of wheels is recommended for faster grading of rough terrain, while front mounting is for finished raking jobs where elimination of wheel marks is imperative. Rear mounting allows rake to be used in any angle position, whether scarifier is in working or "rest" position.

The Rumrill Co., Inc., 1512 Genesee St., Utica, N. Y.

For more details circle 114 on Enclosed Return Postal Card.

New Products

Free Conversion Chart

A reference table in wall chart form designed for engineers, has been published by Precision Equipment Co.

Included are common conversions such as inches to centimeters or watts to horsepower as well as many con-

Precision Factor Chart

versions that are difficult to locate in reference manuals. Some such examples are atmospheres to Kgs/sq. cm., cm/sec to miles/hr., cu. ft. to liters, microns to meters, quintal to lbs., etc.

Precision Equipment Co., 4411E Ravenswood Ave., Chicago 40, Ill.

For more details circle 115 on Enclosed Return Postal Card.

Construction Trucks

Announcement has been made of General Motors Corporation construction trucks, both v-6 powered.

The models are reported to have the stamina and high torque characteristics desirable in dump and ready mix oper-

New Model in GMC Line

ations. Representative of the line is the Model BWA-5508, powered by a 401-cu. in. "V" type 6 cylinder engine. This model has tandem rear driving axles and 90-in. cab giving maximum maneuverability, the manufacturer states.

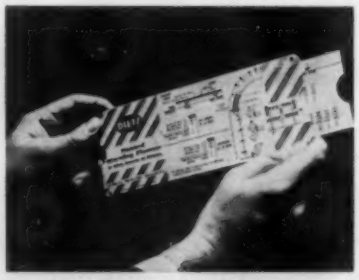
GMC Truck and Coach Division, General Motors Corporation, 660 South Boulevard East, Pontiac 11, Mich.

For more details circle 116 on Enclosed Return Postal Card.

Hazard Warning Planner

This Dietz Hazard Warning Planner is said to take the guesswork out of providing adequate roadside warning devices along construction sites.

By sliding the inner card through the outer card, practically every factor governing the placement of signs, flagmen, traffic cones, barricades, lanterns, torches and flashers is shown at a glance. Diagram at right illustrates a typical work area along a curved section of either urban or rural road. At left



Dietz Warning Planner

are three boxes: Box at top denotes road and visibility conditions on the straightaway and on the curve of the roadway; middle box shows the spacing in feet of the signs, lights and boundary markers for city streets; and bottom box reveals the same information for rural work sites. Back of planner lists directions, plus desirable characteristics of and maintenance tips for warning devices.

Department RB, R. E. Dietz Company, Post Office Box 1214, Syracuse 1, N. Y.

For more details circle 117 on Enclosed Return Postal Card.

Truck And Davit Crane

The new Thern Model H-550B Truck and Davit crane is designed so that the boom can be folded down, out of the way, rather than lifting entire crane out of its base for low clearances.

Maximum lifting capacity is 1500 lb. with the boom retracted to its minimum reach of 39 in. With boom extended to maximum 54 in. reach, lifting capacity is 1000 lb. Construction features include a large roller bearing at top of base and a ball thrust bear-

Thern H-550B Crane

ing at the bottom. These assure effortless full circle turning even when crane is loaded to capacity, the manufacturer states. Mast is ½ in. thick tubular steel. Boom and extension are made from rectangular steel tubing. Crane is powered with a Thern Model 44 W heavy duty double gear hand winch rated at 2500 lb. capacity. Lifting height from floor is 7 ft. 6 in. with boom extended. Total height is 8 ft. in this position.

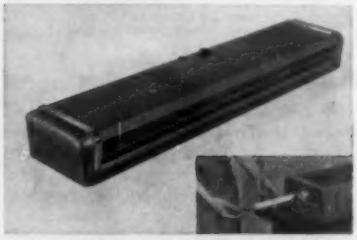
Thern Machine Company, Winona, Minn.

For more details circle 118 on Enclosed Return Postal Card.

Diazo Printer

A new type of rotary diazo white printer that operates with a violet ray tube has been developed by Warren Electr-O-Line Corp.

The manufacturer explains that the new lamp replaces the fluorescent tubes commonly used. Called the Electro-O-Line, it is designed for operation where application does not involve a large



Electr-O-Line Printer

volume of printing. No warm-up period is required in starting operation. The unit features ease of operation, emergency reverse, ball bearing suspension, heavy-duty fully enclosed motor, and high grade spring-steel hangers which simplifies removal of the lamps.

Warren Electr-O-Line Corp., 2864 E. Grand Blvd., Detroit, Mich.

For more details circle 119 on Enclosed Return Postal Card.

Sand Blast Generator

A portable sand blast generator is available for use in concrete block and cement mixing plants and for cleaning bridges and roadway markers.

Manufactured by the Ruemelin Co., this unit produces a high velocity abrasive stream; its portability permits sand blasting of equipment and installations previously difficult to reach. Control

Ruemelin Sand Blaster

valves are equipped with pure gum rubber wearing parts and provide fine adjustments of flow for any type of abrasive, the manufacturer states. For ease of handling, the blast generators can be mounted on 24 in. steel or 16 in. rubber tired wheels. Optional equipment includes a special water and sand mixing chamber to cut down dust concentrations, and remote controls. The generators come in medium and master sizes ranging from 300 to 2,000 lb.

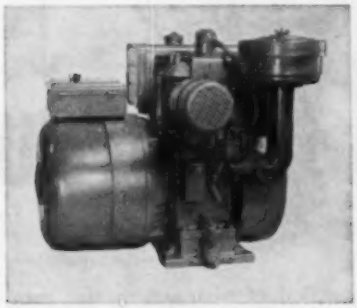
Ruemelin Mfg. Co., 3862-0 N. Palmer St., Milwaukee 12, Wis.

For more details circle 120 on Enclosed Return Postal Card.

Electric Plant

The Universal Motor Company has announced a new model electric plant, the model 41-BHS, that will deliver its full capacity in either 110 v or 220 v. ac.

The plant has two separate receptacles, one to deliver full capacity at 110 v. ac and the other, full capacity of 220 v. ac. A Briggs & Stratton air



Universal Dual Plant

cooled engine powers the unit and has a capacity of 2,500 watts. It is flexible, the maker states, in that any amount of 110 v. ac or 220 v. ac may be used up to the full capacity of the plant.

Universal Motor Company, 454 Universal Dr., Oshkosh, Wis.

For more details circle 121 on Enclosed Return Postal Card.

Welder/Power Plant

The d-c welder/a-c power plant No. DD-250-L from Miller Electric Mfg.

Miller DD-250-L Welder/Power Plant

Co., Inc. is now driven by a Hercules 38 hp. 3-cylinder direct drive injection diesel.

The plant itself is reported to deliver two d-c welding ranges: 50-200 amp. and 150-350 amp; 100 percent duty cycle; rated output of 250 amp. d-c at 40 v, 100 percent duty cycle; maximum open circuit voltage of 65; infinite number of current adjustment steps. Power: 12 kw. 115-230 v single phase, 60 cycle a-c. Up to 6.5 kw a-c while welding. 1 kw. 115 v auxiliary d-c power while welding.

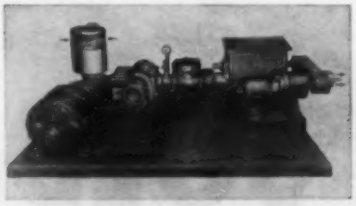
Miller Electric Mfg. Co., Inc., Appleton, Wis.

For more details circle 122 on Enclosed Return Postal Card.

Cement Conveyor

The Air Conveyor Co. has developed a new conveyor that moves cement at the minimum rate of 240 bbls. per hour, up to heights of 100 ft.

The unit is composed of a three lobe positive rotary blower, eight vane



High Rising Conveyor

air lock feeder, filter and silencer and is skid mounted. Ten hp and ¾ hp motors and reducers are furnished. Discharge pipe line is 4 in. in diameter, and connects to any standard 4 in. pipe.

Air Conveyor Company, P. O. Box 908, Schenectady, N. Y.

For more details circle 123 on Enclosed Return Postal Card.

Scraper Attachment

A new 3-½ yd. (heaped) scraper unit to be mounted on Caterpillar Motor Graders has been introduced by the Martin Company.

Called the "GraderscrapeR" the new unit is quickly mounted in place of blade and circle on Caterpillar No. 112, 12 and 14 motor graders. It utilizes grader power and existing connecting points, permitting fast loading and unloading of most materials, the manufacturer states. Mounted on the circle

Martin Attachment For Cat Graders

lift arms of the grader, the unit utilizes full power of grader's tandem drive. It can be loaded without pushing. Once loaded it can be carried at full highway speed to the dump area. Road clearance is 11 in. fully loaded. Unit tilts to one side, to scrape ditch sides while the grader remains level, or tilts to either side 17 deg. and can be shifted to either side of the machine to cut 6 in. outside the grader wheels.

Martin Company, 620 Andrews Ave., Kewanee, Ill.

For more details circle 124 on Enclosed Return Postal Card.

Power Buggy

Aeroil Products Company, Inc., has announced their new Power Buggy.

These walk-behind buggies feature four wheel stability and have a payload capacity of 1500 lb. The models continue to use the dead man brake which automatically brings the unit to a complete stop when the operator releases the right hand lever. An engine guard is now standard equipment around the engine air cleaner. The

Aeroil Power Buggy

1960 models also have a new improved aircraft type clutch cable, and wheel base has been moved forward for greater stability and balance. The unit is powered by a 7 hp gas engine and is available with the standard 10 cu. ft. concrete bucket or a flat pallet that can be used for hauling brick, block, boxes, etc. Overall width is 31 in. and loading height is 37 in.

Aeroil Products Company, Inc., 19 Wesley St., South Hackensack, N. J.

For more details circle 125 on Enclosed Return Postal Card.

Vehicle Warning Lights

Thin styling keynotes a pair of new Pathfinder Stop, Tail, and Directional Lights recently announced by Auto Lamp Manufacturing Co.

Designed as replacement parts, each of these high-intensity 7-in. lights provide 25 sq. in. of illumination and 7 sq. in. of "Reflex" reflector. They meet all Class "A" requirements for emergency road equipment and heavy highway vehicles, the manufacturer notes.

Continued on page 176

Harold C. Scholtz
Manager
TOM JOHNSTON GRAVEL CO.
Ferrysburg, Michigan

"The Twin Disc Torque Converter Drive is ideal for our barge-loading operation. It makes for faster production and lower maintenance costs. The crane operator likes the converter too; it lets him 'feel' the load for control and safety."

This Manitowoc Model 3000 Crane is used to load 600-ton barges on Lake Michigan. Equipped with a Continental SD-802 Engine and a Twin Disc Three-Stage Torque Converter, it averages 3000 cubic yards of gravel per day.

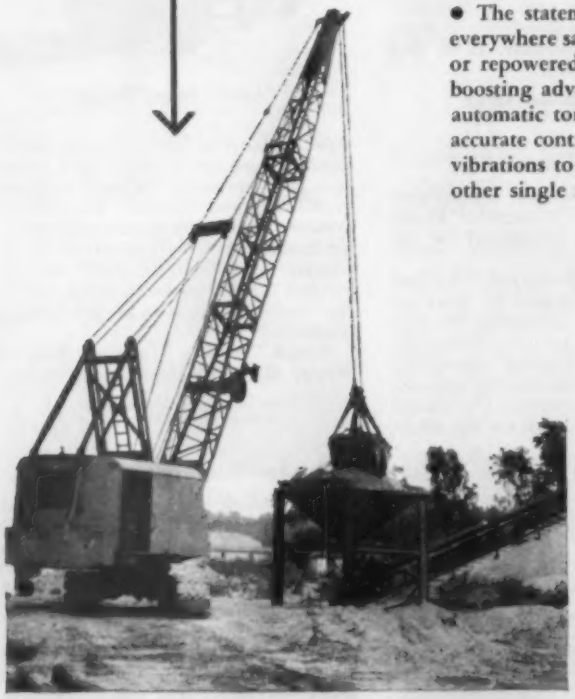
Ernie Bruns
Owner
BRUNS CONSTRUCTION CO.
Zanesville, Ohio

"I'd say a torque converter makes the shovel operator's job twice as easy. Picking up heavy loads is smooth and effortless, and there are no stalls or shocks even in the roughest rock."

On this road building project near Ironton, Ohio, Bruns' Marion 111-M Shovel with Cummins Engine loaded more than a million yards of blasted rock in twelve months. A Twin Disc Torque Converter helped make this outstanding performance possible.

SOLD on torque

• The statements quoted here are typical of what construction men everywhere say about Twin Disc Torque Converter Drive. On your new or repowered machines, a torque converter provides plenty of profit-boosting advantages: elimination of engine lugging and stalling . . . automatic torque multiplication to match load demands . . . smooth, accurate control under all load conditions . . . absorption of shocks and vibrations to safeguard engines, cables and turntable mechanisms. No other single feature adds so much in productivity or long-life service.



TWIN DISC CLUTCH COMPANY, RACINE, WIS.

John C. Hickey
General Superintendent
BAKER & HICKEY
Columbus, Ohio

"A torque converter gives the crane operator perfect control. He has at his command the exact speed ratio needed to 'inch' or hold the machine under full power. Heaviest loads can be spotted exactly without worrying about jerk and sway."

Baker & Hickey's 25-ton Lima Model 44 Crane features a 65' open-throat boom. It gets smooth, efficient performance from its 150 hp Cummins JBIS Engine with a Twin Disc Single-Stage Torque Converter.

James W. Smith
Superintendent
LAYNE INC. OF FLORIDA
Hallandale, Florida

"A torque converter is a must in coral rock digging. A straight mechanical drive couldn't take the punishment. The converter not only takes the shock off cables and power train, but gives us the torque increase we need to go through hardest rock."

This Lorain 85-A Dragline powered by a Cat D337 Series F Engine, is excavating a canal for Layne's $4 million waterfront housing project. A Twin Disc Three-Stage Torque Converter provides extra torque to come through hard cap rock.

converter drive!

All these shovel and crane manufacturers offer Twin Disc Torque Converter Drive as standard or optional equipment . . .

American Hoist	Manitowoc
Bucyrus-Erie	Marion
Koehring	P & H
Lima	(Harnischfeger)
Link-Belt	Thew-Lorain

TWIN DISC

TWIN DISC
Torque Converters

HYDRAULIC DIVISION, ROCKFORD, ILLINOIS

. . . for more details circle 365 on enclosed return postal card

New Products

Continued from page 173

Auto Lamp No. 572

Bodies are finished in black baked-in enamel. The No. 571 light has bracket mounting, easily removable for surface installation. Its twin, No. 572, is similar in construction except with flange for flush mounting, pre-drilled with four holes. Both types are packed with double contact bulb and 2 ft. of heavy-duty wiring.

Auto Lamp Manufacturing Co., 2909 S. Indiana Ave., Chicago 16, Ill.

For more details circle 126 on Enclosed Return Postal Card.

Flasher Converter

Conversion unit for use on flasher warning lights made obsolete by new state highway requirements demanding 90 percent dwell time, is available from Pacific Mercury.

A complete transistorized incandescent flasher circuit in a cylindrical plastic container, the unit WC-5-90, can be

Pacific Mercury Converter

installed in all makes of flasher lights, the maker reports. There are four wires to connect. The converter meets state highway requirements now in effect in Illinois, Michigan, Nebraska and other states demanding more "on" time for flasher warning lights.

Pacific Mercury, 13232 Leadwell, North Hollywood, California

For more details circle 127 on Enclosed Return Postal Card.

Reducing Printer

A new continuous reducing printer and processor, designed for "retrievable miniaturization" of engineering drawings, has been introduced by the Paragon-Revolute Division of Charles Bruning Company, Inc.

This system is said to provide miniaturization without sacrificing legibility of printed matter. Reduced size transparencies are made directly from

Paragon-Revolute Reducer

original drawings for immediate reproduction in blueprint or diazoprint equipment. They can be positive, negative, right or reverse reading, on paper or film. Reductions can be ½, ⅓, ¼, ⅛, 1/16, ½, or 1/32. Special reduction ratios or same size optics are available.

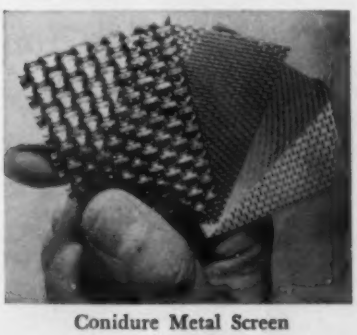
Paragon-Revolute, Division Charles Bruning Company, Inc., 1800 W. Central Rd., Mount Prospect, Ill.

For more details circle 128 on Enclosed Return Postal Card.

Pierced Metal Sheet

A new pierced metal sheet known as "Conidure" has been introduced by Cross Perforated Metals, National-Standard Company.

The sheet is said to last up to three times longer than perforated metal for screening, recovering, or dewatering aggregate, chemical solutions and similar solids-bearing liquids passing through gravity or centrifugal separators. Trapezoidal holes are pierced in sheets of carbon steel, stainless steel, copper, brass or aluminum. Sheet thickness can be up to seven times hole diameter.



Conidure Metal Screen

Hole diameters range from 0.004 to 0.099 inches, and sheet thicknesses range from 0.014 to 0.079 inches. The pierced metal is available in sheets up to 31 in. wide or formed into sheared shapes, cones, segments and cylinders. It can be tensioned and made with clamping grooves or turned edges.

Cross Perforated Metals, National Standard Company, Carbondale, Pa.

For more details circle 129 on Enclosed Return Postal Card.

Truck Mixer

The new Challenge "Legal Loader" truck mixer for 1960 has been announced by Cook Bros. Equipment Company.

The mixer is built in the company's "IV Speed Eto" model and is a combination of aluminum and steel and is said to be up to 2,500 lb. lighter than some separate engine all-steel mixers. The unit is constructed with abrasion and corrosion resistant steel in the

Cook "IV Speed Eto" Mixer

drum and welded aluminum for the tubular main frame, cross members, front and rear drum supports and fenders.

Cook Bros. Equipment Co., 3334 San Fernando Rd., Los Angeles 65, Calif.

For more details circle 130 on Enclosed Return Postal Card.

Two-Way Radio

A 100-watt, 2-way radio operating in the low frequency bands (25-54 meg.) is the latest addition to Motorola's transistorized line of Motrac units.

The new unit will accomodate either positive or negative vehicular battery ground polarity. Reliable, low cost operation is said to be attained through the use of transistors in all receiver and power supply circuits and in two transmitter circuits. Ruggedness and low battery drain are featured in the unit, with no more than .5 amps plus intermittent crystal heater drain.

Communications and Industrial Electronics Division, Motorola Inc., 4501 Augusta Blvd., Chicago 51, Ill.

For more details circle 131 on Enclosed Return Postal Card.

Concrete Anchor

A new type of headed concrete anchor is announced by Nelson Stud Welding Division of Gregory Industries, Inc.

The new anchor, designated Type H-4, is a straight headed bar of cold finished low carbon steel. It can be end welded instantly with Nelson stud welding gun, the manufacturer reports. The anchor, which may be welded to

Nelson Concrete Anchor

flat surfaces or in fillets of angles, is available in five sizes covering a wide range of applications from light to heavy duty. Sizes are ¼ in. shank diam. by 2⅛ in. overall length; ⅜ by 3⅛; ½ by 5⅛; and ⅝ by 6⅜ and ¾ by 7⅞.

Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio.

For more details circle 132 on Enclosed Return Postal Card.

Service Press

Lempco Products, Inc. announces the new Model #651 Crawler Track Pin & Bushing Press.

Known as the "Powermatic," the unit has 150-ton capacity, adjustable double-tooling and "balanced load" design. Fast disassembly and assembly of track is performed without shims and "inching" of ram. Broaching of track links is also eliminated, the manufacturer reports. The new press is said to service all domestic crawler tractor tracks, with track grousers either on or off; controls are fully hydraulic. Hydraulic track indexer, 6,000

Lempco Press.

New Products

lb. pull winch, conveyors and stands are available. The new press is built in both stationary and portable models.

Lempco Products, Inc., 5490 Dunham Rd., Bedford (Cleveland P.O.), Ohio

For more details circle 133 on Enclosed Return Postal Card.

Concrete Cutter

Engineered Equipment's new Tri-Line Concrete Cutter saw is designed with a lockable third wheel for precise, straight cutting.

Other features of the cutter are tricycle undercarriage for maneuverability, variable speeds—0 to 40 ft. per minute, direct hydraulic blade depth control which allows operator to start

E/E Tri-Line Concrete Cutter

cutting without adjusting blade due to its return to pre-set depth automatically. The unit operates like a rip saw and can be used effectively on concrete and asphalt, the manufacturer states. Also available is the manually propelled model.

Engineered Equipment, Inc., Waterloo, Iowa

For more details circle 134 on Enclosed Return Postal Card.

Medium, Heavy-Duty Trucks

The Transtar medium duty, heavy duty and four-wheel drive series of trucks announced for 1960 by Studebaker-Packard includes 18 models.

The medium duty series consists of 1-ton and 1½ ton models. The two 1-ton models have 9,000 and 10,000 lb. GVW rating, a 131-in. wheel base and body length of 9 ft. Six 1½ ton models have 15,000-18,000 GVW ratings. Two four-wheel drive models are included in the line. Four models are available in the heavy-duty two-ton series with GVW ratings ranging from 19,500 to 23,000 lb. Wheel bases in this series range from 131 to 195 in. and body length from 9 to 14 ft. The 195 in. chassis will accommodate an 18-ft. body. The two-ton models are powered by Torque Star 289 cu. in. V-8 engines that develop 210 hp at 4,500 rpm.

Studebaker-Transtar

Public Relations Department, Studebaker-Packard Corporation, South Bend, Ind.

For more details circle 135 on Enclosed Return Postal Card.

Low Frequency Radio

A two-way radio that relieves licensing delay is available from Karr Engineering Corp.

The "D" phone is the company's citizens band unit with modifications to meet the FCC's Limited Radiation Regulations. Under these regulations, a transmitter may be operated without license when generating comparatively limited power (100 milliwatts) and when using an antenna only 5 ft high. The unit available conforms with these regulations and can be bought and put into use immediately. If an application for a citizens band license is pending, the unit can be returned to its full citizens band power when license is received. With its power cut-back modification, it will broadcast up to ½ mile in urban areas and to 1 mile in less built-up areas. In general, its radiation abilities are dependent on the height of the antenna itself and the intervening topography.

Karr Engineering Corp., 2995 Middlefield Rd., Palo Alto, Calif.

For more details circle 136 on Enclosed Return Postal Card.

Generator Sets

Three new 3600 rpm portable gasoline electric plants have been introduced by Winpower Manufacturing Company.

All three units—1500 w., 2500 w., and 3500 w.,—feature an automatic idling control which permits the plant to idle until a load of 100 watts or more is applied, at which time it "revs up" to operating speed and voltage. When the load on the plant is removed, it once again drops back to an idling speed. All units are powered by 4-cycle air-cooled Briggs & Stratton engines. Model G1536BPI is rated at 1500 watts, 115 volts, 60 cycles at 3600 rpm. Model G2536BPI at 2500 watts, 115 volts, 60 cycles. Also available in 115/230 volts. Model G3536BPI is a 3500 watt unit available in 115/230 volts, 60 cycles. Standard equipment includes stop-switch, pilot light, vibration dampers, rope or recoil starter, two 15 amp grounding type receptacles and one 30 amp, 3 wire twist lock receptacle (2500 and 3500 watt models) and carrying handle or dolly.

Winpower 1500 Watt Model

Winpower Mfg. Company, Newton, Iowa

For more details circle 137 on Enclosed Return Postal Card.

Bituminous Mix Tester

A new centrifuge kerosine equivalent apparatus for measuring surface capacity, including absorption, of both coarse and fine aggregates used in bituminous mixtures, has been announced by Soiltest, Inc.

The unit is also used to determine an index (K factor) which indicates the relative particle roughness or degree of porosity. A protecting dome and cover

Soiltest Mix Tester

of fiberglass surrounds the operating parts of the centrifuge; the dome is mounted on an aluminum circular base which also encloses the motor and serves as a switch mounting. A similar apparatus designed for hand operation, with operating speed developed through a gear mounted hand crank assembly is also available.

Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.

For more details circle 138 on Enclosed Return Postal Card.

Engine Welders

Small air cooled engine welders with engine idler and self-starter, introduced by The Lincoln Electric Company, are said to have added convenience and improved economy.

Features of the welder include engine speed control and self starting. The welder will accelerate to operating speed instantaneously when the arc is struck and slow to idling speed 8 to 10 seconds after the arc is broken. Engine wear is reduced, and fuel consumption is dropped 10 to 35 percent with this controlled performance, the manufacturer states. The self-starter includes

starting motor, 12 v. battery, actuating pushbutton, charging ammeter, and charging rate control switch. Charging current is supplied by the welding generator through a special control ciruit. Magneto ignition during operation assures fast-reacting engine performance.

The Lincoln Electric Company, 22801 St. Clair Ave., Cleveland 17, Ohio

For more details circle 139 on Enclosed Return Postal Card.

Attachment Mower

A new, self-contained mower that is easily attached to tractors with standard 3-point hitches has been introduced by The Oliver Corporation.

Connected to the tractor only at hitch points and the power line while it is in operation, the No. 356 performs at PTO speeds of up to 2,000 rpm, according to the manufacturer. Main frame, with tubular arch and solid drag bar, gives support for the mower's 5' in. cutter bar. Heavy-duty knives with

Oliver's 356 Mower

rust-resistant, chrome-plated sections are available as optional equipment. Also included are sealed tapered roller bearings in the drive shaft, integral lift balance spring and safety release, eccentric adjustment for accurate alignment of knife and pitman, and built-in cutter bar lift with which the outer shoe may be raised to a height of 30 in. and the inner shoe to 15 in.

The Oliver Corporation, 400 W. Madison St., Chicago 6, Illinois.

For more details circle 140 on Enclosed Return Postal Card.

Air-Cooled Torque Converter

Clark Equipment Company's Automotive Division has introduced an air-cooled torque converter for use with engines in the 10 to 50 hp class.

The unit is intended for such applications as small road rollers, cranes, and other equipment. Air cooling permits use of the new torque converter on existing engines without requiring auxiliary coolant lines, heat exchangers or fans. The convertor has a 9-in wheel and is rated at up to 80 lb-ft. torque input. Stall torque ratio is 1.7 to 1. The new unit fits a standard SAE No. 4 flywheel housing. Dry weight is 75 lb. Air flow for cooling is provided by fins cast on the outside surface of the impeller housing. Internal oil circulation is maintained by the inherent pressure differentials within the converter itself.

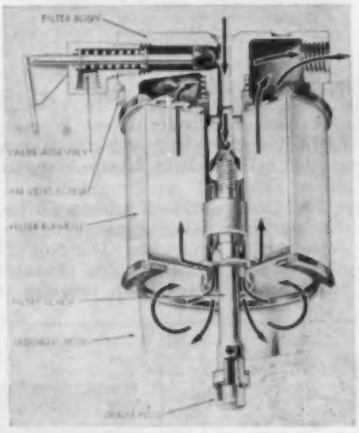
Clark Equipment Company, Automotive Division, Jackson, Mich.

For more details circle 141 on Enclosed Return Postal Card.

Fuel Filter

A new combination fuel filter assembly has been announced by Hartford Machine Screw Company.

The assembly incorporates the features of the standard Roosa Master fuel filter with those of a water trap. Under the filter element there is a glass sediment bowl which enables the operator to see if water is in the fuel. A drain providing for release of accumulated water is located at the bot-



Roosa Master Fuel Filter

tom of the sediment bowl and an air bleed is provided at the top of the filter, in the filter body itself. The Combination Filter is composed of three basic assemblies: The filter body, the element and the sediment bowl. There are two types of filter body assemblies: One for bracket mounting, the other for mounting directly to the underside of the fuel tank.

Hartford Machine Screw Company, Div. of Standard Screw Company, Deerfield Road, Hartford 2, Conn.

For more details circle 142 on Enclosed Return Postal Card.

Diesel Pile Hammer

A new diesel, pile hammer delivering a mean energy of 24,000 ft. lbs. per blow has been added to the McKiernen Terry line.

The large pile hammer, designated the DE-40, containing a 4,000 lb. ram, operates at 48 to 52 blows per minute and weighs 11,350 lb. fully equipped for operation. The DE-40 hammer is completely self-contained, requiring neither boiler nor air compressor. A built in fuel-oil tank holds 19 gallons of diesel fuel. Three gallons of fuel is consumed per hour of normal pile

M-K DE-40 Pile Hammer

driving operation. Carrying its own lubricating system powered by a simple, integral pump to lubricate critical points, the hammer requires no manual lubrication. The new hammer mounts in standard American pile hammer leads and is hoisted and operated by a single load line. Compensating anvil loading improves firing capabilities when abnormal "pile fall" occurs, the manufacturer states.

Pile Hammer Division, McKiernen-Terry Corp., Dover, N. J.

For more details circle 143 on Enclosed Return Postal Card.

TD-25 Cable Control Units

Two new planetary-drive cable control units, the front-mounted Model 160 and the rear-mounted Model 260, now are available for the International TD-25 crawler.

Both the Model 160 and Model 260 are designed to handle the newer heavier equipment developed as matching units for the TD-25. The single-drum Model 160 has a brake capacity of 9,000 lb. line pull at bare drum speed. The double drum Model 260 represents a new concept in cable control units, using a ring gear and pinion to drive a four gear planetary system for each cable drum. High strength nodular iron major castings, with a unit weight of 2,260 lb. are used for the Model 260. The cable drums can handle 248 ft. of up to 5/8 in. cable, attaining a full drum speed up to 650 fpm and a bare drum speed up to 412 fpm.

Consumer Relations Department, International Harvester Company, 180 N. Michigan Ave., Chicago 1, Ill.

For more details circle 144 on Enclosed Return Postal Card.

Wide-Frame Tripod

A wide-frame tripod, the shifting-head type, is now being produced in two models for use on Gurley Optical Plummet Transits.

Rounded legs are of straight-grain maple, fitted to an all-metal tripod head. The head shifts 1¾ in. in any direction in a horizontal plane. Model

New Products

447 comes with extension legs 61 in. long, closing to 31 in. Model 442 has fixed-length legs, 56 in. long. Hinge joints are nylon and the shifting head is of the multi-groove type. The head is permanently lubricated.

Engineering Instruments Division, W. & L. E. Gurley, Troy, N. Y.

For more details circle 145 on Enclosed Return Postal Card.

Radio-Controlled Signal

Development of a mobile radio-controlled traffic signal designed particularly for truck crossings and road construction sites has been announced by the Porta-Signal Division of Dryomatic Corporation.

Porta-Signal Traffic Light

The signal is said to be suited for applications where two-way traffic must be restricted to one lane and must feed in alternate directions. The one-way lane directional signal consists of a standard single face, two or three section heads equipped with ITE-approved 8⅜ in. and 12 in. lenses, and mounted on a portable base containing battery and control unit. The entire unit is portable or can be rapidly disassembled for transportation. Control is accomplished either by push-button cable, or by means of a hand-sized radio transmitter operating on the 27.2 mc Citizens Band.

Porta-Signal Division, Dryomatic Corporation, 806 N. Fairfax St., Alexandria, Virginia.

For more details circle 146 on Enclosed Return Postal Card.

Dual Warning Light

A new Pathfinder Dual Warning Light for emergency vehicles is now available from Auto Lamp Manufacturing Co.

The unit mounts on cab top for two way signaling on snow plow, highway department vehicle, etc. The No. 566 consists of two 7-in. lamps mounted back to back. Each lamp provides 38 sq. in. of illumination. Modern convex rimless plastic lenses gives maximum illuminating surface. Bodies and mounting are finished in black baked-on enamel. This two way unit has two 32 cp. bulbs and double wiring. It can also be used as a flashing light by adding standard flasher in the circuit.

Emergency Vehicle Light

Auto Lamp Manufacturing Co., 2909 S. Indiana Ave., Chicago 16, Ill.

For more details circle 147 on Enclosed Return Postal Card.

Low Pressure Mower Tires

Now available with 36 x 20 low pressure Terra Tires, is the Forty Mile

New Tires on Topeka Mower

Mower from Topeka Hiway Mower, Inc.

Each tire has 210 sq. in. of contact area as compared to 18 in. with regular tires. When used with the company's four wheel drive mower, the greater flotation area permits the mowing of steep slopes, wet ditch bottoms and marshy areas previously trimmed by hand, the maker states. The low pressure tires are interchangeable with regular high pressure tires and can be used on any of the firm's mowers as well as in conjunction with all attachments.

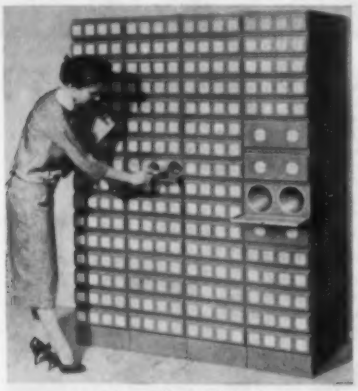
Topeka Hiway Mower, Inc., 623 E. Seventh St., P. O. Box 720, Topeka, Kansas.

For more details circle 148 on Enclosed Return Postal Card.

Rolled Document File

A new storage unit for rolled plans is announced by Plan Hold Corp.

The diameter of this new roll file is 4⅞ in. i. d. and will be known as the LRF (large roll file). The unit has a furniture steel housing for four of the



Plan File Cabinet

storage tubes and is available in seven sizes from 2 to 5 ft. in length. The file is 12½ in. wide and 12 in. high and is finished in gray enamel. It will accept a roll of plans, prints or drawings up to 5 ft. in length.

Plan Hold Corporation, 5204 Chakemco St., South Gate, Calif.

For more details circle 149 on Enclosed Return Postal Card.

Arm Puller Set

A new puller set said to service the boxed-in pitman arm on "Cab-Over" or "Tilt-Cab" model trucks is announced by Owatonna Tool Company.

Set includes two puller bodies for various pitman arms and the special

OTC Pitman Arm Puller

puller hex nuts to fit steering gear levershaft thread size. Any approximate size wrench turns the hex nut which transmits power to the puller, removing the arm from the steering gear levershaft without damage to parts.

Owatonna Tool Company, 474 Cedar St., Owatonna, Minn.

For more details circle 150 on Enclosed Return Postal Card.

Concrete Vibrator

Newest development in concrete vibration from Dart Manufacturing Company is their large air vibrator, the A-49 "Alaskan".

The A-49 is a mass vibrator with a 40,000 vpm rating and designed for heavy mass placement of low slump concrete with large aggregate. A three stage refrigeration system minimizes internal icing of the exhaust and pro-

Dart A-49 "Alaskan"

longs bearing life, the manufacturer states. Under full load characteristics, the unit uses 87 cfm at 9,000 rpm and 90 lb. throttle. An oiler-strainer system is fully automatic and requires no adjustment in air pressure or air volume. As a departure from its normal practice, the firm is also offering this unit on a per-yard lease basis to contractors.

Dart Manufacturing Company, 1002 S. Jason St., Denver 23, Colo.

For more details circle 151 on Enclosed Return Postal Card.

New Products

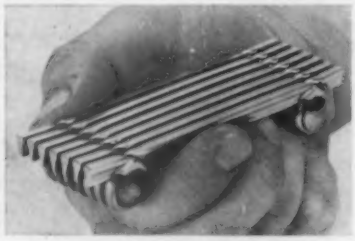
Wedge-Wire Screen

A new wedge-wire screen known as Rema is announced by Cross Perforated Metals, National Standard Company.

Planned for screening, sifting, dewatering, sizing, washing and filtering minerals, the high narrow profiles of the wedge wire permit maximum wires per area of working screen surface, the maker states. Screens are made of stainless and carbon steels; they are furnished in rectangular, oblique angled, round and oval beds with sharp or round bends. Conical segments, cylindrical troughs and many other special shapes are available. Screen wires are available in several profiles including slanting, tapered, flanged and diamond. The profiles are said to eliminate binding and clogging because any particle that passes the top will quickly clear the entire opening. Slit widths down to 0.002 in. can be furnished.

Cross Perforated Metals Plant, National-Standard Company, Carbondale, Pa.

For more details circle 152 on Enclosed Return Postal Card.



Rema Wedge-Wire Screen

Dustless Drilling

Manufacture of a new drilling and dust collecting assembly has been announced by Le Roi Division, Westinghouse Air Brake Company.

The unit is designed for mounting on a Le Roi Tractair, a combination compressor-tractor, and can be used for dust-free drilling in street undersealing and mud jacking operations, and in gas leak detection. Holes are drilled by a Trac Jac with a special 36-in. feed. This unit consists of a model HC10R drill mounted on a reverse feed mechanism and a column supporting arrangement. Dust and cuttings, trapped by a suction cap that fits around the drill steel, are pulled through a hose to a DK-280 Vac-nu-matic dust collecting tank. Operator is able to control drilling from driver's seat. A counter wheel measures and records the distance traveled on an indicator located on the instrument panel.

Le Roi Dustless Drill Unit

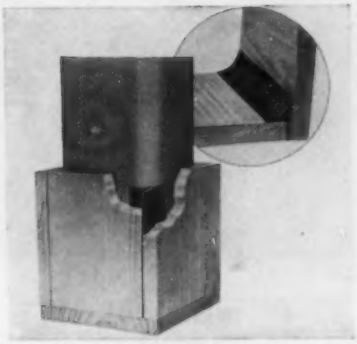
Sales Promotion Dept., Le Roi Division, Westinghouse Air Brake Company, Milwaukee 1, Wisconsin

For more details circle 153 on Enclosed Return Postal Card.

Corner Former

Green Streak Corner Former is a premolded, plastic material said to produce a smooth, uninterrupted, rounded 1 in. radius corner to poured concrete and is available from Servicised Products Corporation.

To install, top end of the flanged section is fastened securely to the edge grain of one side of the form and then pulled taut. The former is then tacked



Green Streak Corner Former

or stapled every 4 in. The other side of the form is placed into position in the conventional method to form the corner joint. This automatically closes the corner former to the required 90 deg. angle and securely locks both feathered edges to conform, the manufacturer reports.

Servicised Products Corporation, 6051 W. 65th St., Chicago 38, Ill.

For more details circle 154 on Enclosed Return Postal Card.

Safety Control Switch

The Model 2340 Hi-Temperature, Lo-Pressure Safety Switch was recently announced by Amot Controls Corporation.

It is primarily intended for engines in trucking, construction, compressor and electrical generating equipment. For larger engine installations in which the switch is easily accessible, Model 2340B with manual reset latch and automatic latch release on pressure increase is applicable. For less accessible installations the 2340A should be used in conjunction with the No. 2965 dashboard mounted pull switch. Units are available with tripping pressures of 5-75 psi, and tripping temperatures of 160 to 220° F.

Amot Controls Corporation, Richmond, Calif.

For more details circle 155 on Enclosed Return Postal Card.

Improved Mixer

A new front discharge design is the latest improvement in the truck-mounted transit mixer manufactured by Willard Concrete Machinery Company.

The new design permits the mixer to drive truck cab first on to a job site, unload to the front with a clear view, and then back out empty. Other features of the unit include a short wheel base and ease of maneuverability due to the elimination of the high mounted water tank, complete control by driver and operation of the mixer from the truck engine.

Willard Concrete Machinery, 11700 Wright Rd., Lynwood, Calif.

For more details circle 156 on Enclosed Return Postal Card.

Tandem Freighters OK'd on More Toll Roads

A six-month trial of tandem trailer truck combinations up to lengths exceeding 60 ft. was authorized over the Northern Indiana Toll Road and Ohio Turnpike.

The 7½-mile Calumet Skyway Toll Bridge in Chicago also is expected to join the experiment if suitable arrangements can be made for an assembly area at the north end of that facility. The combination of these three toll facilities will allow 404½ continuous miles of superhighway travel for tandem trailer trucks from the Ohio-Pennsylvania border into Chicago.

Assembly areas for the "make-up" and "break-up" of the so-called "double bottom" units will be provided at strategic entry and exit points along both toll roads. "Double bottoms" are not permitted on Indiana or Illinois public highways and those in excess of 60 ft. are also not permitted on Ohio state roads.

Regulations for the tandem trailer truck operations are patterned somewhat after those recently in effect on the New York Thruway and the Massachusetts Turnpike, where "double bottoms" have been legalized permanently. The Kansas Turnpike also is experimenting with "double bottoms" and these combinations are also permitted on public highways in several western states. The Indiana and Ohio regulations provide for:

(1) 98 ft. maximum overall length, with 40 ft. for each semi-trailer; (2) 127,400 lb. maximum gross weight (governed by a formula of 90,000 lb. plus 1,070 lb. per foot for each foot of the combination exceeding 60 ft.); (3) 22,400 lb. maximum weight per single axle and 36,000 lb. per tandem axle on the Indiana Toll Road; (4) 21,000 lb. per single axle, maximum on the Ohio Turnpike, or 24,000 or up to 32,000 lb. per combined axle load on any two successive axles for certain axle spacings; (5) a minimum of 5 axles and a maximum of 9 for each tandem trailer combination.

Minimum and maximum speeds are specified, as are qualifications of experienced drivers. Tandem-trailer operation in both states will be on a special permit basis.

Bituminous features appear between pages 184 through 210.

NBCA's Quality Program Getting Off the Ground

Hot-mix contractors show they mean business as 10-point improvement effort is reviewed at Detroit

A year has passed since the National Bituminous Concrete Association launched its Quality Improvement Program at its Miami meeting. *(Roads and Streets, March, 1959.)* And it's been a fruitful year for the program. NBCA's contractor members, gathered again last month in Detroit, were told of tangible progress in translating their ambitious program of product betterment into action.

Addressing the convention on February 1, NBCA's Coordinator of Research, Charles R. Foster reported these developments:

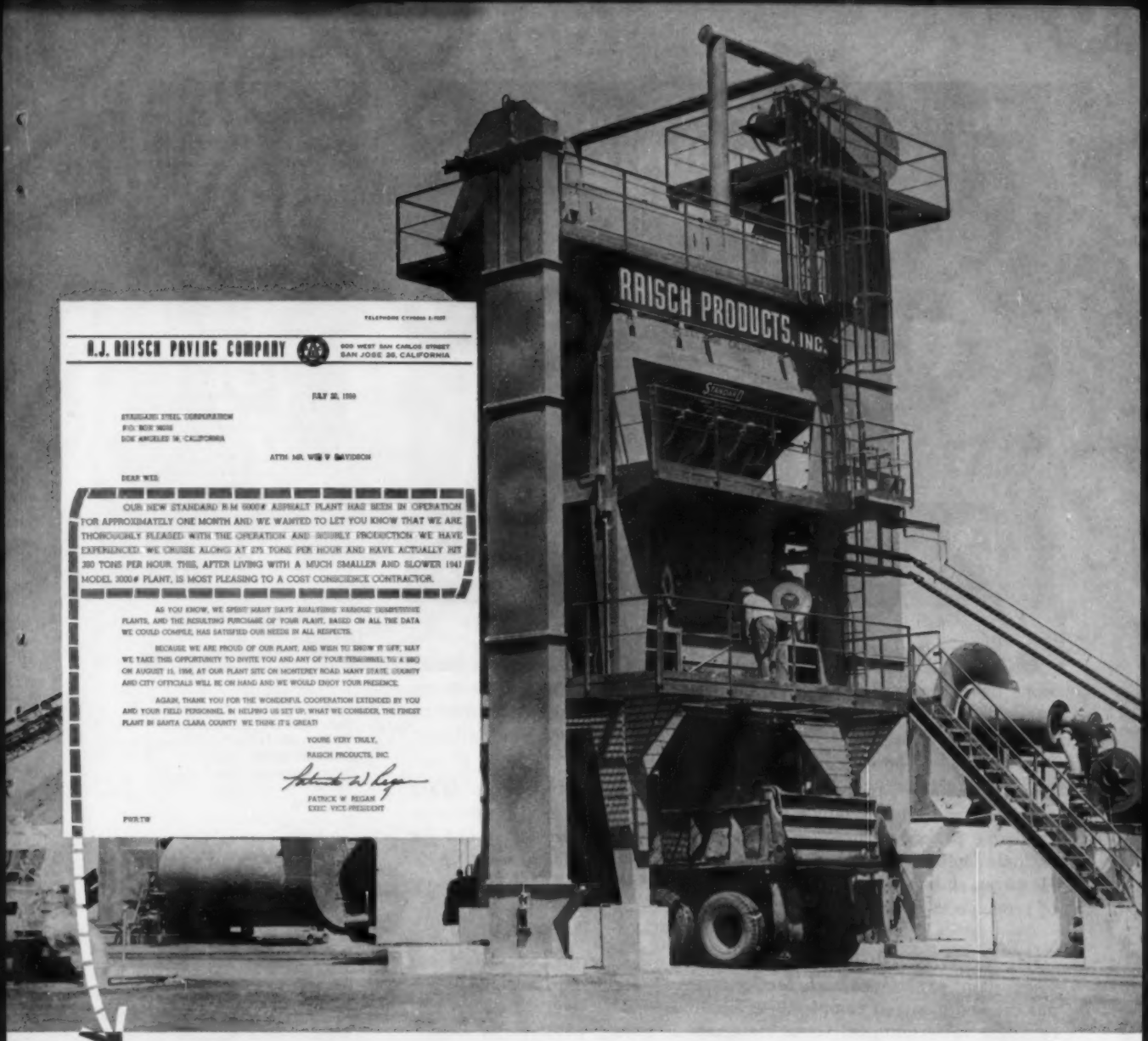
1. A pilot survey of a segment of the field's literature completed.
2. Assignment of priorities to ten major projects, with preliminary start made on several.
3. A financing plan which will underwrite $125,000 in research cost for 1960 and $1,343,000 over the next five years.
4. First steps in selecting a university campus as the permanent site for a research center.
5. A beginning in the coordination of state-level research being done by NBCA's state associations and the highway departments and colleges.

Charles Foster, readers will recall, was selected for this coordinating job early in 1959, coming from the Waterways Experiment Station of the Corps of Engineers at Vicksburg, Mississippi. He has conducted his new work temporarily from that city. Foster's work is under the direction of NBCA's Quality Improvement Committee consisting of R. R. Stander, a Mansfield, Ohio, contractor, chairman; J. Rogers Martin of the Oklahoma hot-mix association, secretary; and eight contractor members plus the association president as ex-officio.

The Association decided in 1958 to launch a program—unique in contractor association annals—under which asphalt paving contractors would contribute to the solution of pressing problems in getting the best and most economic construction for their pavement type, as a prime competitive weapon. The Association's effort is planned to supplement the basic work of the Asphalt Institute on one hand, and the technical groups such as the Association of Asphalt Paving Technologists on the other. The expectation is for exerting a type of influence—finally expressed at the job level—that can best be done by the organized contractors themselves.

At the Miami convention in February, 1959, a booklet was issued giving full preliminary details of a Quality Improvement Program (again, see March, 1959, Roads and Streets). This booklet, widely distributed, was eventually reprinted with minor changes and is available today free to inter-

Continued on page 187



A.J. RAISCH PAVING COMPANY
600 WEST SAN CARLOS STREET
SAN JOSE 26, CALIFORNIA

JULY 22, 1958

STANDARD STEEL CORPORATION
P.O. BOX 3608
LOS ANGELES 54, CALIFORNIA

ATTN: MR. WM P DAVIDSON

DEAR WES:

OUR NEW STANDARD R-M 6000# ASPHALT PLANT HAS BEEN IN OPERATION FOR APPROXIMATELY ONE MONTH AND WE WANTED TO LET YOU KNOW THAT WE ARE THOROUGHLY PLEASED WITH THE OPERATION AND HOURLY PRODUCTION WE HAVE EXPERIENCED. WE CRUISE ALONG AT 275 TONS PER HOUR AND HAVE ACTUALLY HIT 300 TONS PER HOUR. THIS, AFTER LIVING WITH A MUCH SMALLER AND SLOWER 1941 MODEL 2000# PLANT, IS MOST PLEASING TO A COST CONSCIENCE CONTRACTOR.

AS YOU KNOW, WE SPENT MANY DAYS ANALYZING VARIOUS DEMPSTONE PLANTS, AND THE RESULTING PURCHASE OF YOUR PLANT, BASED ON ALL THE DATA WE COULD COMPILE, HAS SATISFIED OUR NEEDS IN ALL RESPECTS.

BECAUSE WE ARE PROUD OF OUR PLANT, AND WISH TO SHOW IT OFF, MAY WE TAKE THIS OPPORTUNITY TO INVITE YOU AND ANY OF YOUR PERSONNEL TO A BBQ ON AUGUST 15, 1958, AT OUR PLANT SITE ON MONTEREY ROAD. MANY STATE, COUNTY AND CITY OFFICIALS WILL BE ON HAND AND WE WOULD ENJOY YOUR PRESENCE.

AGAIN, THANK YOU FOR THE WONDERFUL COOPERATION EXTENDED BY YOU AND YOUR FIELD PERSONNEL IN HELPING US SET UP, WHAT WE CONSIDER, THE FINEST PLANT IN SANTA CLARA COUNTY. WE THINK IT'S GREAT!

YOURS VERY TRULY,
RAISCH PRODUCTS, INC.

PATRICK W. REGAN
EXEC. VICE-PRESIDENT

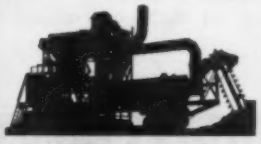
PWR:TW

"WE CRUISE ALONG OVER 275 TONS PER HOUR!"

"Our new Standard R-M 6000 pound Asphalt Plant has been in operation for approximately one month and we wanted to let you know that we are thoroughly pleased with the operation and hourly production we have experienced. We cruise along at 275 tons per hour and have actually hit 300 tons per hour."

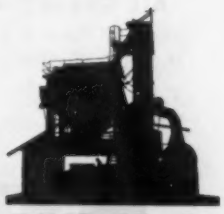
STANDARD
ASPHALT PLANTS

STANDARD / Complete line of Asphalt Plants 2000 through 8000 pound capacity.



Model T-M • Trailer-mounted, self-contained.

Model R-M • Semi-portable and stationary



Model S-E • Self-erecting, fully portable.

STANDARD STEEL CORPORATION *Manufacturers of: Asphalt Plants • Rotary Dryers • Kilns • Coolers • Cryogenics*
GEN. OFFICES AND PLANT: 5003 BOYLE AVE., LOS ANGELES 58, CALIF. • MIDWEST OFFICES AND PLANT: DECATUR 03, ILL. • EASTERN OFFICES AND PLANT: LOWELL 03, MASS.

. . . for more details circle 362 on enclosed return postal card

NBCA's Quality Improvement Committee. *(Standing)*: W. T. Milam, Central Contracting Co., Ada, Okla.; Stanley S. Watkins, Bituminous Surface Treating Co., Inver Grove, Minn.; Gilbert A. Bruno, Warren Brothers Road Co., Syracuse, N.Y. *(Seated)*: George M. Myers, Geo. M. Myers, Inc., Eldorado, Kansas; Charles R. Foster, NBCA Coordinator of Research; Richard R. Stander, Mansfield Asphalt Paving Co., Mansfield, Ohio, (Committee chairman); J. Rogers Martin, Hot Mix Asphaltic Concrete Association of Oklahoma (secretary); P. E. Blouin, Lane Construction Corporation, Meriden, Conn. (Not in picture: committee members Donald O. White, American Asphalt Paving Co., Chicago; and James F. LeSage, Industrial Asphalt Co., Los Angeles, Calif.).

NBCA'S QUALITY PROGRAM

Continued from page 184

ested individuals or organizations. Copies may be had by writing H. K. Griffith, Executive Director, National Bituminous Concrete Association, 1145 Nineteenth Street, N.W. (Suite 218), Washington 6, D. C.

The 1960 Program

Plans announced for 1960 in this Program includes ten projects here outlined. All ten are given No. 1 priority, but with order of preference. (Funds totaling $72,000 budgeted).

Literature Survey (Priority 1a). Objective is to provide literature surveys to researchers working on the Quality Improvement Program, to government agencies, institutions, and associations, and to NBCA member contractors.

Improvement of Asphalt Cement (1b). Objective, to study the characteristics of asphalt cement from the standpoint of slower loss of life in the mixing cycle, more resistance to fatigue cracking, and better resistance to displacement of the asphalt from the aggregate by water. The primary study would be a consideration of the physio-chemical characteristics desirable in a bituminous binder, and a comparison of these characteristics of selected "good" and "not-so-good" asphalts.

Design Manual and guide specifications for heavy duty bituminous pavements (1c). Objective, to translate results of several million dollars' worth of research done by the Corps of Engineers on heavy duty airfield pavements into form suitable for highways. The methods used by the Corps to adjust the design criteria of both flexible and rigid pavements to different aircraft configurations and operational concepts can also be used to adjust the design criteria to highway loadings.

"NBCA would be doing a service to the highway industry by making these adjustments," notes Mr. Foster's report. "Also, since the Corps considers its rigid and flexible pavement designs comparable in load carrying capacity, this project would result in comparable designs for highway loadings for use in studying the designs in the several states."

Cooperation with state associations (1d). Objective, to provide assistance to the associations in their research.

Improved riding quality (1e). Objective, to study and recommend the desired characteristics of a system that will permit spreaders to lay asphalt to a predetermined profile.

Allowable moisture in hot-mix pavement (1f). Objective, to establish a truly allowable percentage

Table A
Hot-Mix Contractors Plan Big Outlay
Estimated Cost of NBCA's Quality Improvement Program (broken down by fields involved rather than projects)

Field	1959	1960	1961	1962	1963	1964	Sum.
Asphalt	1,500	15,000	20,000	20,000	30,000	35,000	121,500
Aggregates	—	4,000	25,000	25,000	40,000	40,000	134,000
Equipment	—	5,000	15,000	15,000	20,000	20,000	75,000
Design	1,500	10,000	10,000	3,000	15,000	10,000	49,500
Construction	—	4,000	30,000	30,000	50,000	50,000	164,000
Workmanship	—	4,000	8,000	10,000	20,000	15,000	57,000
Miscellaneous							
Scholarships		12,000	15,000	15,000	18,000	24,000	84,000
Lit. Surveys		12,000	25,000	30,000	10,000	4,000	81,000
Coop. with State		4,000	25,000	25,000	45,000	50,000	149,000
Supporting		2,000	2,000	2,000	2,000	2,000	10,000
Subtotal —	3,000	72,000	175,000	175,000	250,000	250,000	925,000
Research office	42,000	53,000	56,000	64,000	98,000	105,000	418,000
Total —	45,000	125,000	231,000	239,000	348,000	355,000	1,343,000

of moisture in hot-mix pavement.

Effect of aggregate coating in hardening of asphalt cement (1g). The objective, to determine if certain aggregate coatings produce hardening of the asphalt cement, and if they do, develop test methods to identify these coatings and develop specifications to exclude aggregates which have coatings which produce excessive hardening.

Supporting studies (1h). Objective, to give the coordinator flexibility in conducting small-scale unscheduled research in support of other programs.

Merit systems (1i). Objective, to make a study of the effectiveness of merit systems in improving quality, and if they are effective, to recommend the best system.

Scholarships (1j). Objective is to produce engineers who have had some research experience in bituminous pavements, and accomplish beneficial research on bituminous pavements.

State Research Programs

Coordination of NBCA's program with the activities of its 26 members associations occupied much time during Foster's first year. He took part in planning local research programs, met with state secretaries and state engineers on specific problems, and presented papers at meetings held or sponsored by state associations. This contact spotlighted the already extensive activities of many of NBCA's state associations—for example research and scholarships currently being sponsored.

Highlights of the local-association research and quality improvement activities in several states:

Ohio. The Ohio association has actively sponsored research on drying aggregates at Ohio State University (under direction of Prof. Robert F. Baker). Several theoretical studies on the physics of heating and drying aggregates have been reported on. Using an available model dryer, the effect of several operating variables are being studied.

Bryant M. Collins, president-elect of NBCA. Collins, who heads Collins Construction Co. of Texas, Austin, succeeds John W. Kelly, Oklahoma City.

Recently the Ohio Research Council invited the Ohio Association and the NBCA to assist in their research work, both technically and financially and representatives of both groups attended a meeting of the council and participated in discussion on the "Project Reologic Properties of Bituminous Concrete" which will be conducted at OSU under Professor Baker.

Michigan. The Michigan state highway department has found that, with the mixes used, a little water causes the mix to become soggy and a poor surface texture results; but that when moisture content is less than 0.05 percent there is no trouble

Continued on page 206

The World's One-And-Only "Trafficulator" Brings Your Job Into Our Laboratory

This fast-moving machine pre-solves surfacing and paving problems. Working with the Trafficulator (Traffic Simulator), our research engineers can simulate actual road conditions. This provides answers *ahead* of field operation.

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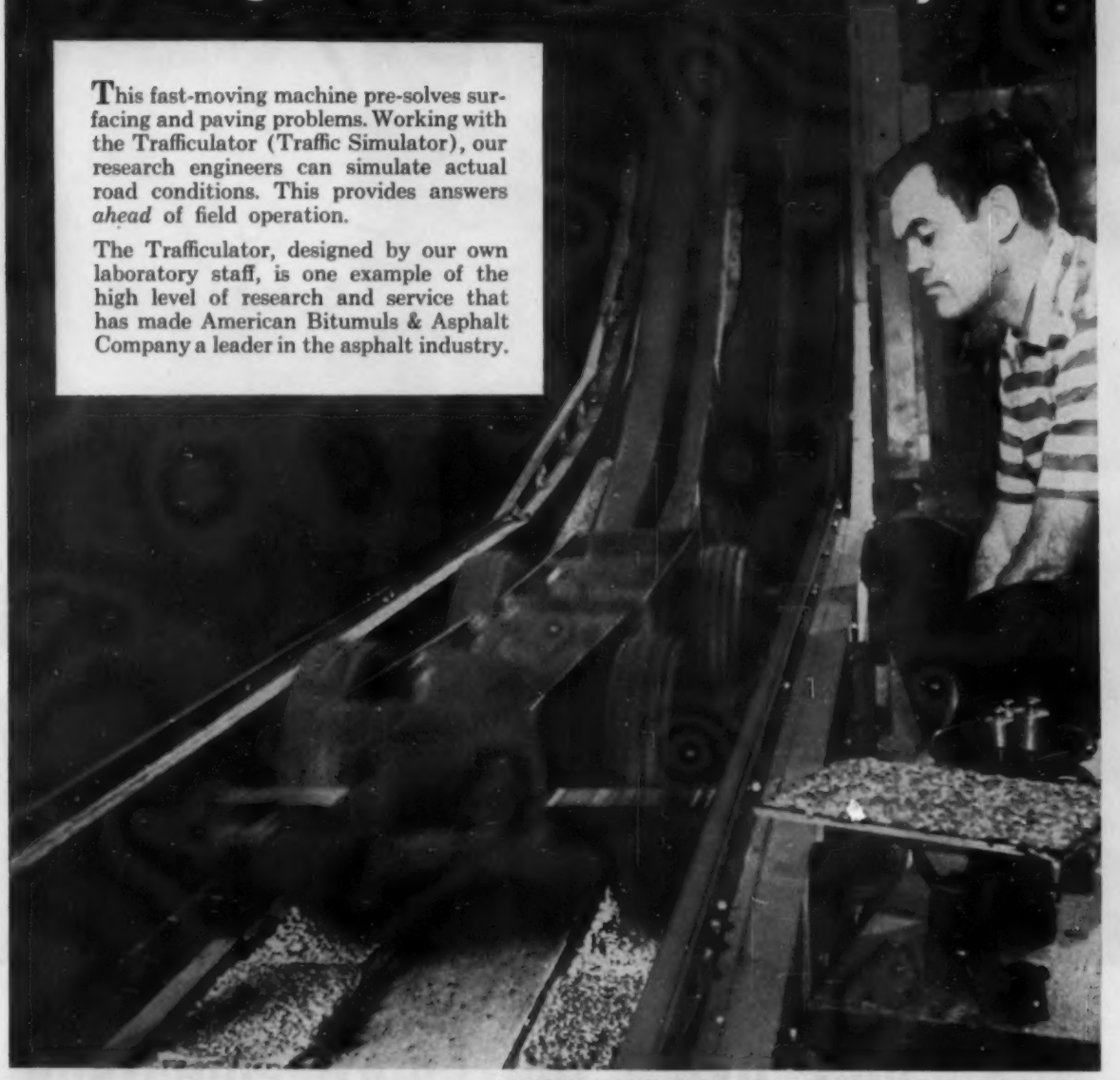
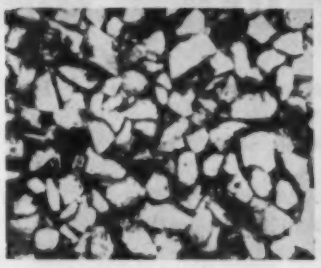
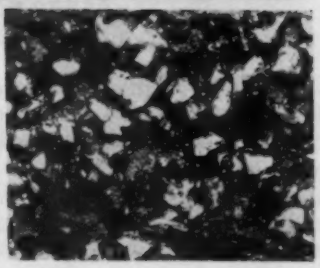


Trafficulator Tests Prove Cationic Bitumuls Reduces Loss of Siliceous Cover Stone





After 1,000 passes by the Trafficulator, cover stone retention on the Cationic panel (left) is 70% better (by weight) than on the panel prepared with regular grade emulsion.

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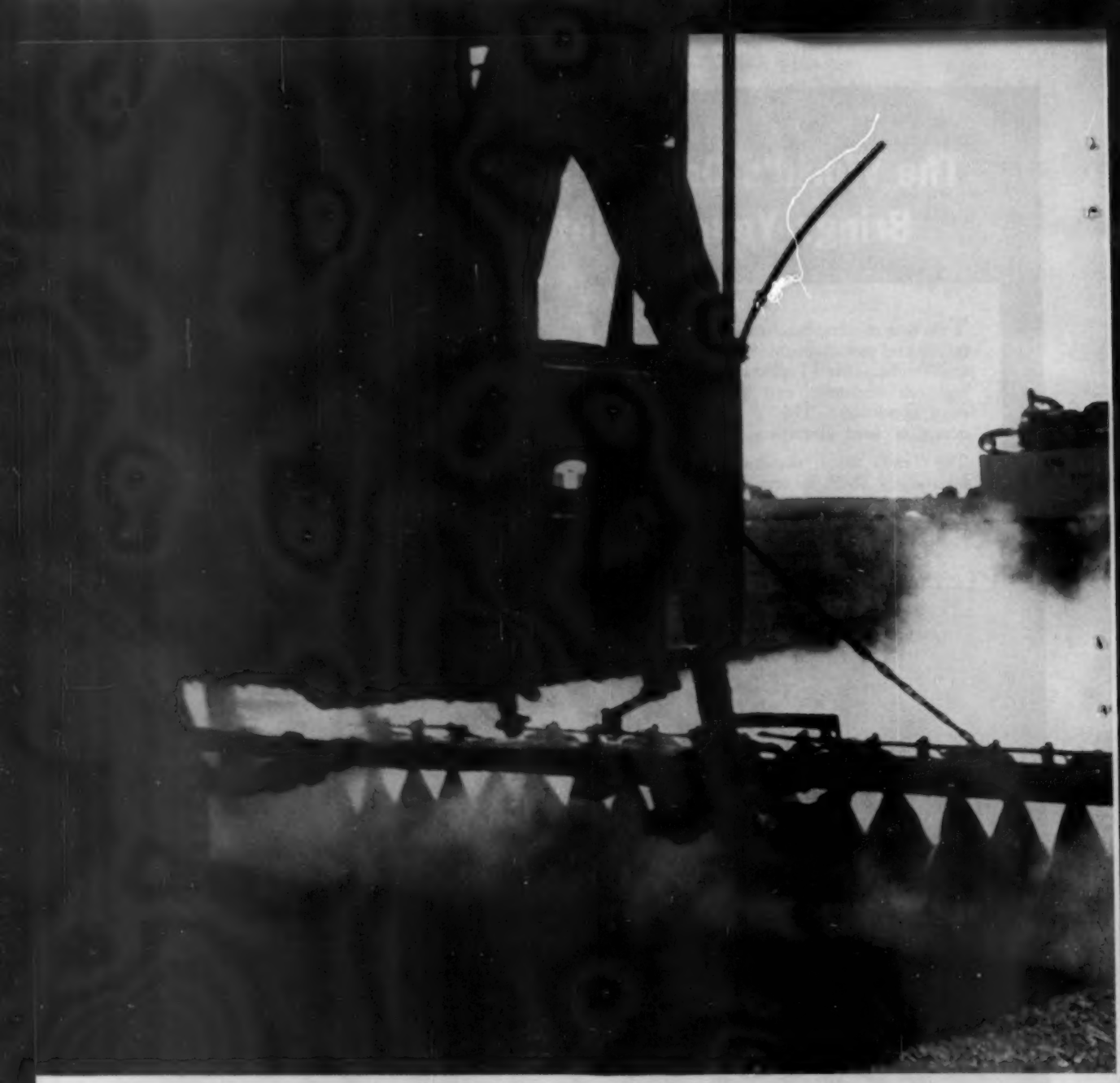

Proving the improvements in

The highway re-paving crew above is laying a section of state road that will add another page of field test results and data in the growing file on Armour's road construction chemicals.

Since Armour first developed chemicals for improving asphalt paving, Armour research men have been constantly at work proving the improvements. This testing aided development of two groups of outstanding paving chemicals; **Redicote®** compounds, anti-stripping agents for asphalt cements and cutbacks; Armour *Cationic* Asphalt Emulsifiers for emulsified asphalts.

REDICOTES—Armour Redicotes improve adhesion of asphalt onto any aggregate. Redicotes make every kind of weather good asphalt-paving weather. No wait for drying after a rain . . . no wait for morning dew to dry. Redicotes are economical because it takes so little to do a job. In some cases as small a concentration as 0.2% will give complete coating and insure anti-stripping properties. Armour Redicotes offer additional satisfaction with guaranteed uniformity in batch after batch. Redicotes . . . make asphalt adhere better . . . cost less and are quality controlled.

Armour road construction chemicals

ARMOUR'S CATIONIC ASPHALT EMULSIONS—Armour cationic emulsifiers ionize in solution to give positively charged particles. The "break" of these cationic asphalt emulsions may begin to take place the moment of contact or may be delayed to suit particular requirements. Surface or atmospheric conditions have little effect on the break or the adherent properties of the emulsified asphalt. The bond is such that it displaces water on the surface and prevents stripping. Emulsions made with Armour cationics give you: controlled break-time . . . ease of emulsification . . . built-in anti-stripping.

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As testing continues and new improvements are found, they will be subjected to the same rigid tests that have made Armour chemicals highly efficient and economical.

For additional information about these road construction chemicals, talk to Armour's chemical specialists or write for samples and these booklets: "Redicotes," "Armour Cationic Asphalt Emulsions."

ARMOUR INDUSTRIAL CHEMICAL COMPANY
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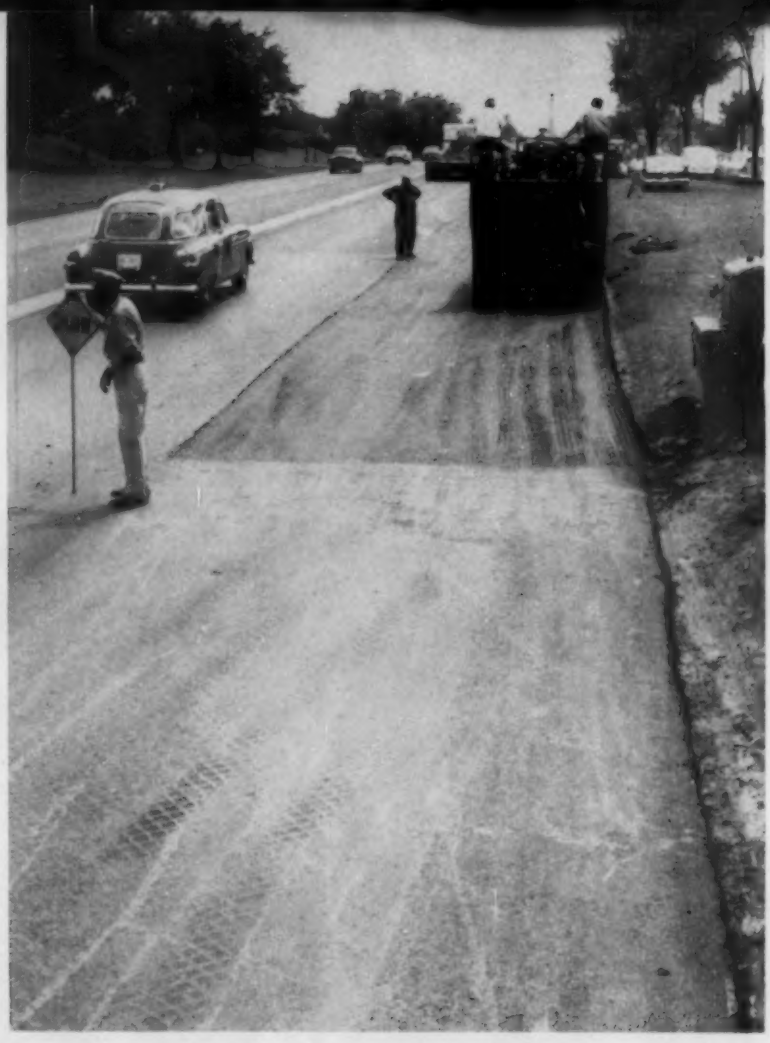
Compacting asphalt concrete with the 30-ton Bros roller on Highway 100 west of Minneapolis.



Bernes Construction Co., of Indianapolis, compacting base material on the U. S. 52 construction project at Lebanon, Indiana, with the 8,500 lb. wheel load roller.

Compaction Results With the Heavy Self-Propelled Rubber-Tired Roller

Manager, Road Machinery Division, Bros Incorporated

By A. O. Williamson

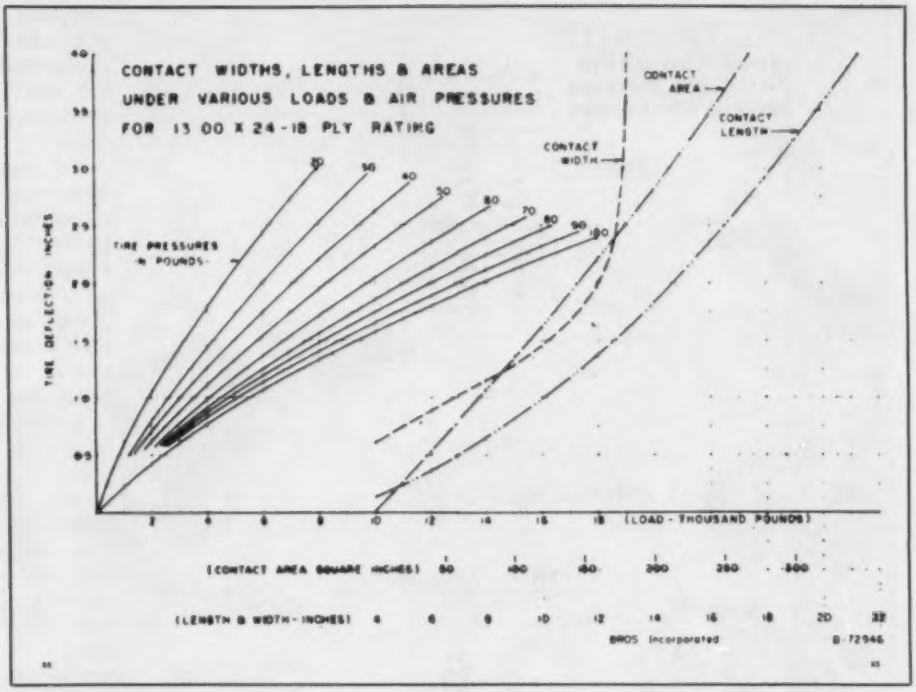


Figure A

Mr. Williamson has been associated with the design and development of compaction equipment for 25 years at the Bros Company. He has delivered many talks before national and regional conferences on road compaction and has written numerous articles on the subject for construction publications.

• • •

An over-simplification of proper road construction would be that of producing a load bearing structure equal to or greater than the heaviest legal loads permitted on it.

This, of course, has always been the engineering goal, but until recently, sufficient information and equipment have not been available to be certain such results were being obtained.

For example, charts on tire inflation pressures, contact pressures and contact areas of tires under load have been available for only the past few years. Now such charts as Fig. A are being used by state highway engineers to ascertain if the pneumatic tire rollers to be used on a project can produce proper load bearing support.

Too, only since 1957 has there been heavy-weight self-propelled pneumatic tire rollers that could produce compaction forces greater than those of the largest over-the-road truck trailer units.

Tests since then, principally those conducted by the Ohio department of highways and the Corps of Engineers, have established the value of the new methods and equipment. These tests results will be mentioned later. First, to help put them in perspective, one or two general statements are in order.

Highways, until recent years, were designed primarily for function; that is, moving traffic from place to place. But as traffic volume increased, a great deal more of the design emphasis was given to safety. And justly so.

Thus, wider highways and shoulders, controlled access, gentler grades, over and under passes and other improvements were given top consideration in the design. Reshaping the landscape in this manner required millions of cubic yards of fill material. Fills of great depth were often necessary.

Consolidation procedures of these fills were arbitrary in many respects, based on the types of native materials used, depth of lifts and compaction equipment available. Testing procedures were not always entirely adequate.

In many instances, further consolidation under traffic, natural settlement of the material and improper drainage quickly resulted in pavement break-up of various kinds.

Similar problems in the bases and subbase layers of the roadbed produced similar deleterious effects on the surface.

Thus, it became very clear that consolidation must be complete and uniform throughout all stages of the roadbed, in order to provide a sound, long-lasting structure.

When the new 8,500 lb. wheel load self-propelled pneumatic tire roller, introduced by Bros Incorporated in 1957, was first used for asphalt surface compaction, I witnessed on several jobs how it sheared the asphalt because of in-

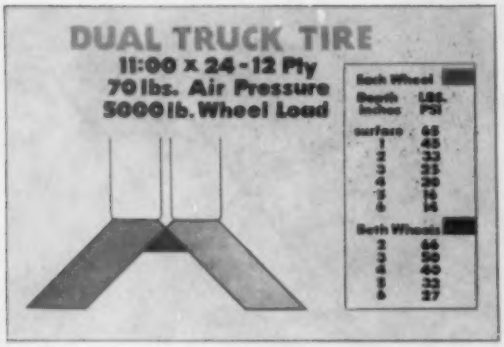


Figure B

Figure C

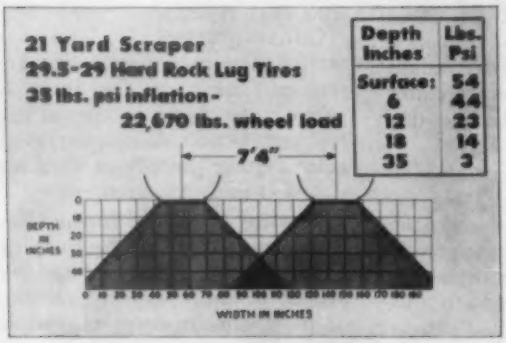


Figure D

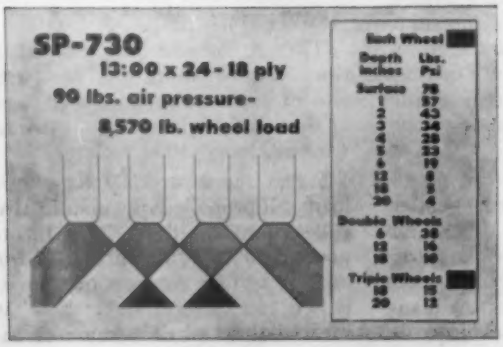


Figure E

adequate previous consolidation of the substructure. Using a lesser compaction load would only have left the underlying fault to be eventually discovered by traffic loads.

To preclude such happenings, many states now are writing proof or test rolling precedures into compaction specifications; a 50-ton pneumatic tire roller with 90 psi air pressure is generally specified.

And, of course, the good sense to such a practice is obvious; isn't the task of the road simply to support pneumatic tire loads?

Accepting this as the fundamental requirement for a highway, the problem is to determine the most certain, economical and fastest way of producing the result.

A diagram of the compaction pressures produced by a typical tractor-trailer load, (Fig. B,) indicates the problem involved: The 1100 x 24, 12-ply dual truck tires are inflated to 70 psi and carry a 5,000 lb. per wheel load. The surface pressure is 60 psi. At a depth of two inches below the pavement surface, the compactive forces from each wheel interlock, producing 66 psi pressure. At a depth of six inches, the force is still 27 psi.

Now let us imagine that the surface over which this tractor-trailer travels was compacted by a 10-ton steel wheel roller. Under ideal rolling conditions, maximum pressure produced at the surface can be interpreted as 300 psi per inch of rolling width (see fig. C). But as this force penetrates into the material being compacted, it diminishes too quickly. As a depth of six inches, pressure is only 15 psi.

And under typical job conditions where contact arc of the compression roll on the steel roller increases because of material build-up, the pressures are proportionally less, decreasing to as low as 11 psi at six-inch depth.

Consequently, it is evident that the tractor-trailer can and will produce further, consolidation with resultant deformations.

Another interesting diagram is shown in Fig. D. It represents a fully loaded 21-yd. scraper with 29.5 x 29 Hard Rocklug tires. While the compaction force or load is quite great, the pressures do not interlock

Continued on page 202

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This brief introduction shows why these five machines match every finishing need:

879B FINISHER—Universal machine for contractors wanting greatest job range from a single finisher.

SA-60 FINISHER—World's largest, fastest, most powerful finisher on tracks—lowest cost per ton-mile for contractors with highest capacity jobs.

SB-60 FINISHER—Same as SA-60 except it paves on rubber tires for even greater maneuverability and portability.

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SJ-50 ROAD WIDENER AND PAVER—Only machine that handles all types of widening and shoulder paving with all materials, including concrete. Exclusive tamping-leveling attachment for asphalt paving.

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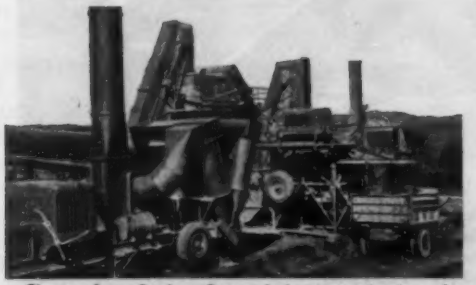

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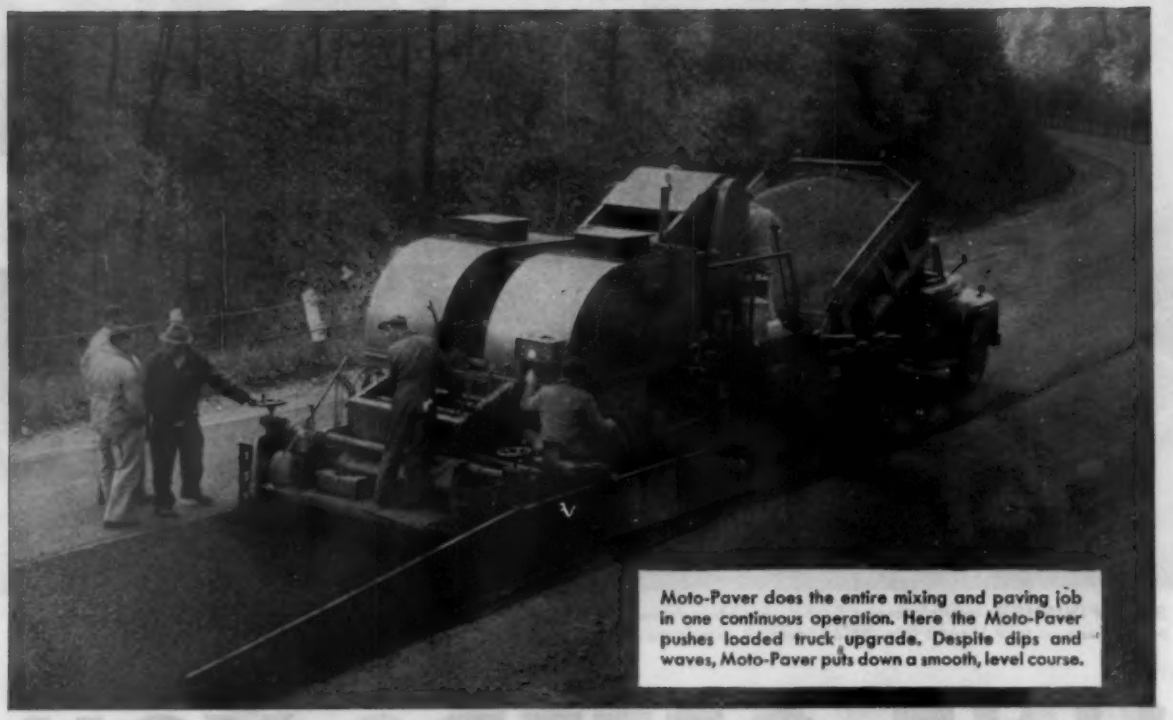

Moto-Paver does the entire mixing and paving job in one continuous operation. Here the Moto-Paver pushes loaded truck upgrade. Despite dips and waves, Moto-Paver puts down a smooth, level course.

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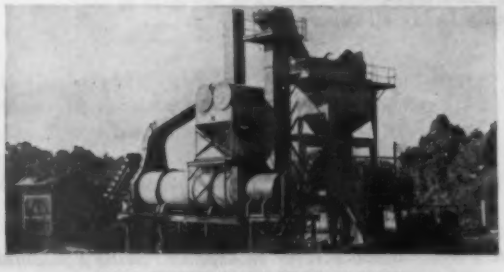
Moto-Paver uses any kind of aggregate and any type of bituminous material. See your H&B distributor —or send for Bulletin MP-55, which gives complete information.



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NEW MOBILE 20—40—60 PLANTS

Completely wheel mounted—no crane needed for erection or dismantling. All remotely located units driven by electric motors. 3 sizes: M-20 (40-60 t.p.h.), M-40 (120-140 t.p.h.), M-60 (160-225 t.p.h.)

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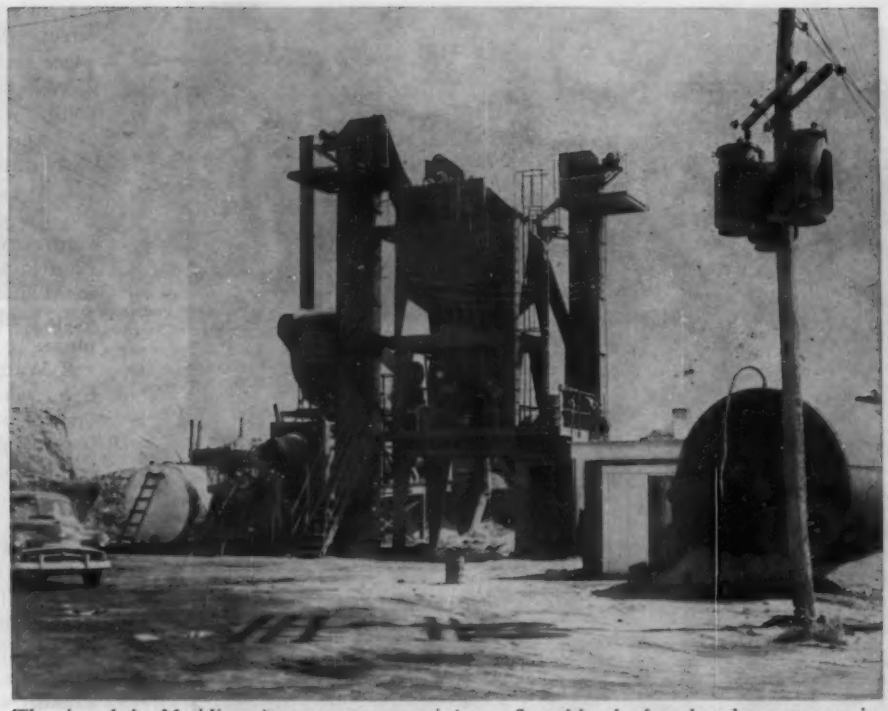


The size of the Meridian city street program is best reflected by the fact that the contractor installed this new Hetherington & Berner Model G-25 (2,500 lb.) hot mix plant for the work. (Initial and supplementary program, 80,000 tons of mix.)

Hot-Mix Plant Supplies 32 Miles of Streets

The supplying of asphaltic mix for a large program of street renovation often touches off the question of how best to supply the mix. A city of moderate size, where the program certainly will not be a continuing one of such magnitude, will usually find it best to award the job to a contractor.

That was the case recently in Meridian, Mississippi. This 50,000 population city which has grown very fast as a result of industrialization and nearness to military bases found itself with antiquated streets. A city-wide job of street modernization was financed by a bond issue, to be retired by assessments on abutting property.

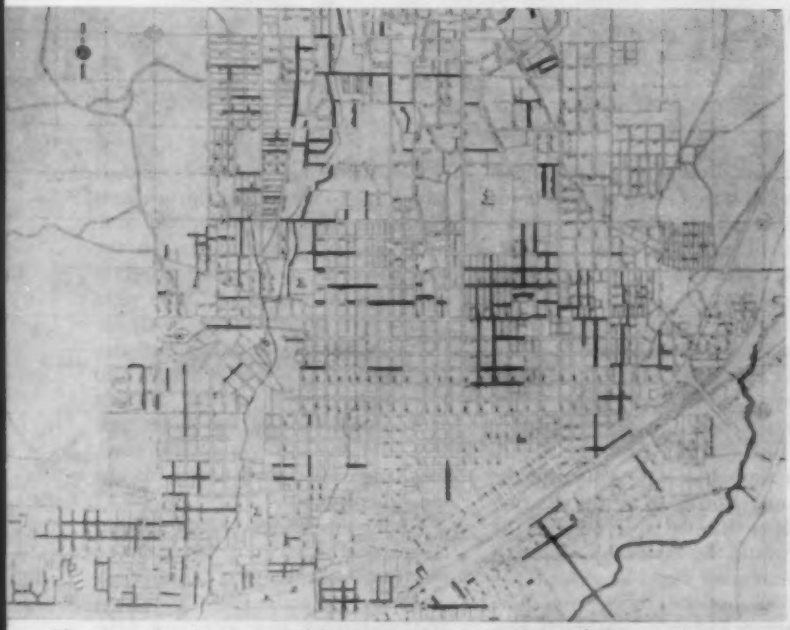
Not just a weatherproof surfacing but also regrading of streets for increased width and better profile was involved. The upshot was to call for bids on the complete grading and paving, with award given to Mid-State Paving Co., a local firm, on low bid of $497,000.

This company which has done extensive asphalt and other work for state road jobs and military bases in the area, decided to set up a new asphalt plant to handle the program. The expectation was that the plant, located just outside the city, would be available for any supplementary street work and also for other contracts in the area. The satisfactory bid price was made possible by the total work prospects.

Contractors as well as city officials who hope to see street improvement programs developed in their communities will find interest in the experience in getting the program approved in Meridian. The plan as first offered proved too costly for the available financing. The city engineers went over the details and scaled down some of the features, postponing some of the street parcels, and the job was readvertised, resulting in the contract award here mentioned.

Under the revised program, as an economy, the city forces agreed to the responsibility for removing driveway culverts and furnishing and installing new concrete pipe for drains and culverts. The con-

Making final blade passes to cut down and widen a residential street in the program of Meridian, Mississippi. Ditches have been relocated several feet back of their old position.



City map, showing the ambitious program (heavy lines) being carried out to modernize the city in keeping with rapid growth.

tractor's end was to regrade the street, widen it as prescribed, and place surfacing.

With 180 working days' time limit the improvements were carried out during late spring and early summer, as follows:

1. As soon as city crews had pulled out the old driveway culverts, the contractor's crew began with a work plan laid out to utilize its equipment in steady progression and keep traffic disturbance to a minimum.

2. Water and sewer and gas manholes were located and work begun on resetting them, usually to a lower grade to conform to the new street profile.

3. Then grading began in earnest. the contractor employed two motor graders (Adams and Cat 12), a Euclid scraper which worked the loose soil largely without pusher, a Cat D6 dozer, and necessary trucks. Grading work was planned whenever possible to minimize the amount of dirt transport and for most of the job the grader-scraper-dozer combination did it. High places in the undulating streets were cut down and low places built up in all cases to a new profile set to give good drainage to individual home sites and permit the removal of storm water without going all the way to underground storm drains. Grading and widening totaling 75,000 cu. yd. was one of the bid items.

4. Working closely with the grading crew, the electric company reset poles and restrung its lines where necessary, while the gas company's Fordson mounted ditcher trenched for resetting gas lines. Good coordination of this work was achieved, as agreed on when the contractor signed up.

5. A 6-in. compacted base of sand clay was placed, mixed and rolled to 20 ft. width for most residential streets. The contractor employed several Ferguson rubber-tired rollers, working with motor graders.

6. The surfacing 18-ft. wide consisting of 2 in. of plant mix, totaling 336,600 sq. yd. or about 34,000 tons, was placed routinely with a Barber-Greene finisher and rolled largely with rubber-tired rollers (BMCo and Ferguson). A Littleford power broom, Allis-Chalmers

Continued on page 202

PRIMARY PLANTS: Use with Intermediate and Secondary Plants or alone for producing ballast. Jaw crushers 1524 to 3042 in size. Choice of portable apron or built-in feeder. Some have scalping screen ahead of crusher.

IN-LINE GRAVEL PLANT: Extra large capacity with low weight. Meets most highway load limits. Has 1036 jaw crusher, 30" x 24" rolls, 4' x 12' — 2½ deck vibrating screen . . . yet weighs only 55,900 lbs. on the road!

INTERMEDIATE PLANTS: Used with Primary and Secondary Plants to increase flexibility of operation and boost output. Meets highway height, width, and weight limits. Models offer choice of either jaw or roll crusher.

SECONDARY PLANTS: 4 models of Secondary Plants offer choice of 3018, 4022, and 5424 twin roll crushers or 4022 triple roll crusher with 3' x 10', 4' x 10', or 4' x 12' — 3½ deck vibrating screens.

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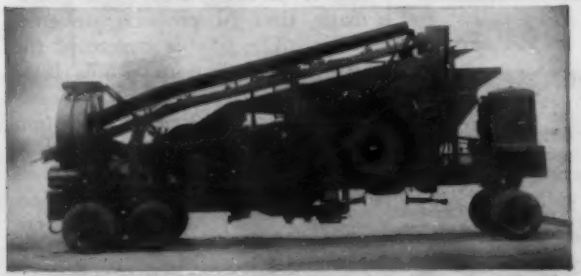
BOTTOM DECK FEED PLANTS: Exclusive method of routing material through plant gives twice the effective screening area of conventional plants, also lets operator equalize load between jaw and roll crusher while plant is operating. These and other features, give extra capacity and unusual control of gradation. Four models.



44 AND 45 SERIES: Full deck sand screen rejects fines and small rock bypasses jaw crusher. These and regular Bottom Deck Feed features

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32 MILES OF STREETS

Continued from page 200

HD6 tractor-shovel and hauling trucks rounded out the equipment.

7. Hot plant mix was supplied by a new Hetherington & Berner Model G-25 plant set up on the city's edge. This 200-ton plant with Hiway hot oil heater and Barber-Greene stockpile conveyor was purchased especially for the city street program. It augments other facilities used by the contractor on recent military base work and state road projects.

The new standard cross-section provided a 3 ft. shoulder and ditch. Backslopes and berms were sprigged for development of protective and attractive ground cover, this bid item coming to 374,000 sq. yd.

No curb and gutter were included in the program. The simplified improvements here outlined have proved popular, and there is public interest in additional street work.

Material testing to control asphalt paving quality has been handled by Shellstone Laboratory, Baton Rouge, La. The contractor designed the mix using imported limestone and local sand, subject to the approval of James Slaughter, city engineer of Meridian.

COMPACTION RESULTS

Continued from page 194

until a depth of 35 in. So that, in order to produce uniform consolidation, a machine should be used which provides full coverage of the material being compacted, as well as proper wheel loads.

Fig. E illustrates the Bros 30-ton self-propelled roller with 13:00 x 24, 18-ply tires and an 8,500 lb. wheel load at 90 psi. At the surface the pressure is 78 psi with each wheel. Around 6 in. depth the force is 19 psi. However, it interlocks with the down pressure of the next tire, and thus, doubles the pressure to 38 psi. At about 18 in. depth, the force of these two tires are joined by the force of the third tire, and still produces 15 psi on the road materials.

So, considering these interlocking compaction forces, it is easy to see how a heavy-weight roller of proper design has become the most ideal type of compaction tool in obtaining suitable support and stability in the subgrade, base and surface materials.

Multiple wheels provide multiple areas of compactive effort, which over-lap and interlock with proper wheel spacing, multiplying the pressure within the material being rolled.

Also, the wheel loads can be varied upon need in a range from 3,000 to 8,600 lb. per wheel and tire pressures from 30 up to 150 psi.

This is important in several respects. First, in stage compaction where weak native materials are being used for fill, structural strength of the material must be built up; this can be accomplished by deflating tires and using minimum to maximum ballast load. As the load bearing support is developed during rolling, both load and tire pressures of the roller can be increased to maximum. In most all conditions, however, where optimum moisture control is adhered to, maximum loading can be maintained, taking variance only in the tire pressure.

Also, the tire inflation range or variable is important in asphalt concrete compaction, because as asphalt concrete cools or "sets-up," it resists compaction; and, therefore, increasing tire air pressures under maximum load overcomes this resistance to further densification of the concrete.

Each pass over this type of work would benefit by increased wheel contact pressures (increased air pressure) to increase densities and strength.

No less important is the oscillating or freedom feature of pneumatic tires in properly designed rollers. The pliable nature of the tire plus oscillation permits it to "knead" and exert uniform compactive effort to actually reposition materials in fill, base and surface layers so that a tight, uniform mass is the result. Too, it seeks out air and moisture voids, expelling them so that the grade and base will not suffer from possible locked-in forces, entrained moisture and shifts

Continued on page 204

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COMPACTION RESULTS

Continued from page 202

of material by load stresses.

These roller performance features combine to produce uniform, high densities in the materials being compacted—precisely the results required. We were pleased to cooperated with Fred Kimble, chief of the flexible paving section, Ohio department of highways, who did much of the original testing on heavy wheel load pneumatic tire rollers.

In 1957, separate compaction tests were set up in Clermont and Licking counties in Ohio on 3-in. thickness hot mix asphalt concrete. Comparative tests between a steel roller and the 8500 lb. wheel load pneumatic tire roller were conducted under closely controlled conditions. Test results with this pneumatic tire roller showed that the range of void content varied less than two percent, while core samples averaged 99.9 percent of design.

In contrast, a range of from 5 to 20 percent void content with an average of 8.9 percent variation was produced by the steel wheel roller. The range of Marshall densities were from 85 to 102 with an average of 96.1 percent of design density. The work procedure of these tests was to perform a "break-down" pass with a steel wheel roller while the mix temperature was around 325 deg. This was immediately followed by the 30-ton roller, loaded to 8,000 lb. per wheel with 100 psi tire pressure.

The project engineer in his formal report wrote that there was no surface checking, regardless of mix temperature. Also, the pliable action of the pneumatic tires plus oscillation prevented the mix from being moved laterally during compaction. The result was that densities on the edges as well as the longitudinal joints were consistent with densities throughout the pavement cross-section.

One of the most publicized tests was conducted in 1958 on the Columbus Air Base construction project in Mississippi. One of these heavyweight rollers was used in all stages of compaction. This test was critical, because some stated doubts as to asphalt concrete's ability to provide adequate load bearing support for heavy bombers had been presented to the Federal Congress.

Upon completion of the runway, including asphalt concrete surfacing, a special 212,000-lb. cart with tires simulating a bomber's landing gear and with pressures of 226 psi made 20,000 passes over the runway. The surface showed no evidence of rutting or shoving, even where the heavily loaded cart reversed directions. Further, the pavement had every appearance of being as sound and as smoothly textured as the day it was laid.

During the runway paving operation, some experimenting was conducted on mix temperatures. Results with the 30-ton pneumatic roller clearly indicated that the specified 98.5 percent density could be achieved in three passes at mix

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Views And Comments

By H. G. Nevitt

The Road Structure

The third group of characteristics in our discussion of a rational thickness design for flexible pavements concerns what might be called the road structure proper—that is, the surfacing and foundation courses. As noted in our early discussions, in reviewing their properties we are thinking primarily of the situation where a heavy structure is required due to low support power in the subgrade or basement soil. This situation justifies treating the subgrade as a separate structural element. Obviously, it is in the design of the thicker structures that accuracy and consistency are essential elements, if we are to gain the full economic advantages possible in the flexible pavement.

We can start off by saying that this phase of this design represents the most difficult situation. In theory we should know all about the action of structures composed of mineral aggregate particles bonded by cohesive material: certainly enough work has been done on this subject, enough theories have been presented, to encourage such a conclusion. From the practical standpoint at least this is far from true. These theories either do not appear to represent the facts accurately enough for general use, call for too complex handling of the problem, or in other ways are far from satisfactory. It is true that the triaxial approach is frequently used and many think this is the last word in theory. Actually, the assumptions made in utilizing the triaxial data—for example, the discrepancies between the relatively static condition evaluated by it as compared to the dynamic results of repeated stressing—make its application questionable in the eyes of many engineers.

Nevertheless, some analysis can be made of the fundamental characteristics of structure of this type and their obvious relationship to the functional needs of a flexible pavement.

This part of the pavement performs two distinct functions. The top layer or wearing surface must stand local stress concentrations and not fail by rutting, shearing or ravelling. However, the structure as a whole—that is, both the foundation course and the courses above it, acting as a unit—must be able to withstand the stresses which can result from distributing the load and reducing its intensity to the point that it can be carried by the subgrade.

Essentially, the surface layer requirements are that sufficient binding strength be present to avoid the loss of aggregate by suction or impact effects, and that the surface layer have and maintain sufficient shear strength to withstand localized stresses. While justifying attention, these characteristics are not difficult to obtain and do not need further discussion here. The important question is the required total thickness of the road structure, along with the contribution to its load support value by each layer thereof, and the requirements placed on each layer to properly carry out the support functions.

In a previous article we noted that the load affects must be dispersed so that by the time the stresses reach the subgrade their concentration—or more correctly, their lateral rate of change in concentration—can be withstood by the subgrade in the design critical condition. This pressure distribution can come about in two ways. One is through the arch or interlock effect of the various courses: if these materials have a high angle of friction there will obviously be a more rapid dispersion of the concentrated stresses as we go down into the pavement structure. The other way in which the stress can be distributed is through a beam effect.

Essentially, this requirement is that the structure withstand the upward thrust adjacent to the load so

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NBCA'S QUALITY PROGRAM

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from surface texture. Drying to this degree is difficult because of residual moisture in the coarse aggregate. NBCA's Michigan association, the state highway department and Wayne County are cooperating on a project to determine economical means of drying aggregates to this degree.

In the planning stages, the work of professor Baker in Ohio was known by Scott Baker of the Michigan NBCA group, and full use of the information was made to avoid duplication of effort. Also, the coordinator furnished a report on drying studies made by the Waterways Experiment Station. The Michigan highway department has installed thermocouples and made trial runs prior to the 1959-60 winter shut-down, with interesting preliminary results.

To complement field studies of the drying problems, the Michigan Association retained the Western Laboratories. A method has been developed for simulating in the laboratory the sogginess that occurs in the field.

Also the Michigan NBCA group has worked with the state on five experiments with pneumatic rollers on asphalt, and on experiments in the use of coarse graded fine aggregates in bituminous mixes.

A very significant advance in quality improvement in Michigan is the new requirement by the Michigan department for automatic batch controls on all asphalt plants after May, 1960. This requirement was supported by the association.

North Carolina. The Carolina Asphalt Association is cooperating with this state's highway commission and its state college on studies of the hardening of asphalt in hot-mix pavement. Tests will be made on samples from full-scale plant production. The variables will include several types of asphalt, aggregate, and mixes, as well as range of temperatures. NBCA has recommended extension of the study to include field test sections, to demonstrate the effect of high temperature on subsequent loss of pavement durability.

Pennsylvania. The Pennsylvania NBCA association is not sponsoring outside research but is active in conducting research internally on problems affecting hot-mix pavements. The five items listed in Table B are typical of a dozen studies during the past year. Those listed are where individual association members made substantial contributions of time and effort. These studies are generally in cooperation with state highway engineers.

Oklahoma. The Oklahoma Turnpike Authority invited the Hot-Mix Asphaltic Concrete Association of Oklahoma to assist in studying a condition observed on the Turner Turnpike. A 5-mile section is showing excellent performance, whereas the two adjacent sections built under other contracts show some cracking. All were built to the same design and specifications. The Authority asked the Association to suggest a test program to determine the answer.

In cooperation with the highway department, deflection measurements were made which indicate that the deflection in the cracked and uncracked sections are substantially the same. Based on these data, it is concluded that the trouble is probably in the mix. Records indicate the uncracked section was laid at approximately 265° F, while both of the cracked sections were laid at temperatures approaching 300° F. Samples have been taken and tests are being made to determine the hardening that has developed in the asphalt cement and other characteristics which might influence its behavior. It is anticipated these tests will show the basic cause of the difference in performance. A report is being readied for the Turnpike Authority.

Literature Survey. In any research, Foster explained at Detroit, the first step is a survey of the literature to determine what has been done by others. A comprehensive literature survey was included in the original Ten-Point Quality Improvement Program to avoid duplication in making literature surveys in connection with the various projects. H. C. Howell of Miller-Warden Associates presented a report on the pilot study of a system of coding on IBM cards a segment of the Highway Research Board literature from 1942 through 1958. An evaluation of the system by Mr. Foster showed it to be capable of producing very good literature surveys rapidly. Plans for continuing the literature survey are included in NBCA's 1960 and long-range program.

AASHO Road Test. During the past year NBCA issued a report, following inspection of this project, aimed at correcting premature interpretations that had gained circulation on the performance of the thinner asphalt pavement sections, designed to fail earlier, this report noted that adequately designed sections have made good showings.

CBR Design Curves for Asphalt Rollers. The paper "Proof-Rolling of Subgrades" by Foster and Turnbull presented at the 1960 Highway Research Board meeting, shows that the compaction effect of rubber-tired rolling can be compared with the compaction effect of full-scale traffc by comparing CBR design curves for the rolling and the traffic condition. In line with NBCA's Research Project lc, the paper contains CBR design curves for a 50-ton towed roller but curves were not available for the lighter roller used to roll asphalt. The coordinator arranged with R. G. Ahlvin, author of the CBR design curves of the Corps of Engineers, to develop curves for typical rollers used on asphalt. These curves have been published and are available. Additional curves will be prepared if the need develops.

University Site. The NBCA's research is temporarily centered at Vicksburg, Mississippi, pending selection of a location at a university. A university-based research office is considered desirable for prestige, access to a library, ease in attracting staff, and benefits from associations with professors and researchers. Ten universities have been under consideration, with a choice soon to be announced.

New York Continues Use of Consultants

Although noting it has increased the amount of highway engineering work done by its own staff, the New York State department of public works disclosed it is continuing to rely primarily on the services of outside consultants for the project load.

A department spokesman said that of the $970 million in design work under way as calendar 1960 began, department engineers were handling about 28 percent up from 21 percent of the $760 million in design work in progress a year previous.

NEVITT

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that there will be no flow in the subgrade material. This calls for beam properties in the pavement and the presence of tension or cohesive action in its upper layers.

Where we are dealing with a highly elastic subgrade, the effect is exactly the same as though we were dealing with a low stability soil. That is to say, to avoid deflection in the pavement beyond its flexing ability you must have enough thickness to reduce the load concentration under the wheel to the value set by the permissible elastic deflection.

In theory an alternate way of doing this would be to build a pavement with tensile resistance in the bottom layer to provide beam support immediately under the load as well as tensile resistance in the top layer to withstand the upthrust adjacent to the load. In practice, this has not generally been considered feasible—though the success in recent years of asphalt bound bases which display just such characteristics may be due to this action, and a trend to such bases seems likely.

It would seem evident, from the above discussion, that the structural resistance of the usual flexible pavement is dependent upon the shear resistance displayed by each of the pavement layers, and the cohesive and tensile resistance obtainable from the upper (and perhaps lower) layers. It should be noted that the stresses, and hence resistances, are generally dynamic and values of this type should control. It is true that the pavement must likewise be able to resist the static loads imposed by a stopped vehicle; but the allowance for repetitions of the normal loadings generally provides a sufficient margin of safety to offset the lower static resistance usually shown by the cohesive layers.

When we attempt to proceed from these generalities to a technique for reflecting the test values as well as the thicknesses of the various layers, we run into real trouble. Theoretical analyses of two-layer and three-layer systems have been presented. But to our knowledge they have not formed the basis of a practical or generally accepted design technique. There is a great difficulty with these theoretical approaches (in addition to their complexity): the probability that the assumptions made in the mathematical development simply do not describe the way the road structure actually functions. Certainly, the writer's limited experience in attempting to analyze support data by them has been unsatisfactory; but yet it is quite likely that they represent, through some further developments or modifications, our greatest prospect of an eventual solution to this difficult problem.

The widely used, practical approaches to this matter of thickness design that we are aware of are three.

1. The first might be described as an arbitrary tabulation developed from experience, giving the proper design thickness for various types of traffic over soils of specified characteristics.

2. The second is the CBR method in one of its various forms, which simply specifies a thickness along with limited control of the component layer.

3. The third is the California method, in which a cohesion factor is used to evaluate the supporting layer characteristics.

The first two apparently disregard (except perhaps by implication) any cohesive values in the upper pavement layers, with their considerable aid in carrying the load. Work in recent years has shown that this is too important a contribution to so neglect. The CBR method does specify some bearing value characteristics in the varying supporting layers, but does not modify the design thickness if materials above the minimums so required are utilized in the structure. The California method in theory ignores the frictional effects, reflecting only the cohesive value obtained through a specific test technique.

In practice, these test results have been replaced by arbitrarily specified values for different component courses, and presumably this is a method by which the effect of the frictional characteristics of the layer, as well as its cohesive resistance, have been brought into the picture.

The procedure likewise leads to a combined resistance value for a

series of layers of varying characteristics. In a very general way this might be said to attempt to do the job, if the influence of the frictional characteristics on the cohesive values selected is included.

On the other hand, selecting arbitrary values for the resistance characteristics of these layers is clearly not a completely satisfactory procedure because better friction in the lower courses and better cohesion in the upper courses (through good design) might be advantageously supplied on some projects. A truly rational or sound design technique would clearly reflect these facts in the resultant thickness obtained.

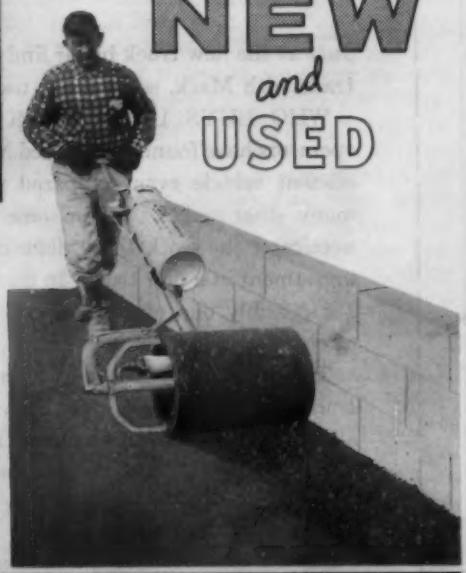
It is difficult to predict the future in this phase of the design technique. Undoubtedly the methods which do not reflect the aid given the structure by a highly cohesive asphalt pavement or by a highly frictional foundation layer will be abandoned in time. We cannot afford to overdesign with these materials, yet we cannot afford to merely thin down the pavement in some arbitrary fashion when these situations are present. Whether the California approach can be modified to more accurately express the factors leading to support is difficult to say. It does have the merit of including the three basic resistances. It should be susceptible to modification to properly include or reflect each variable in them. And as a presumably arbitrary or empirical approach it deserves much credit for these along with its simplicity.

Probably the considerable attention given to this problem will lead to its further development or even more satisfactory approaches. The optimum will be something based on theory but with due allowance for the actual mechanics of the resistance process and the test properties of the layers used rather than theoretical assumptions concerning them. Meanwhile, the engineer gathering data for later use in analyzing pavement performance needs primarily to obtain a record of the layer thickness along with the test characteristics of each.

In completing this series of discussions concerning the needs of a thickness design, we would like to make one point. The reader who has patiently stayed with us will perhaps mainly have the feeling that the subject is in a very elementary stage, and is perhaps one marked by considerable confusion. It must be admitted that a suitable and easily used text book formula or procedure for designing flexible pavements is not yet with us.

On the other hand, he should realize that remarkably good progress has been made in this field. The designs reached by some of the present methods, despite their drawbacks, are surprisingly near to what is needed. Undoubtedly the situation will show steady improvement as more attention is given the subject. Meanwhile when every engineer understands, even if only in a very general way, the effect of loadings, how the pavement resists them, and similar, he will be able to more intelligently meet the many problems which arise in highway work.

And all of us can help by backing up the demand for better methods and by aiding in the keeping of the best possible records on present roads. In the final analysis these roads contain the answers to all of our problems if we merely can gain enough information from them to finally establish the needed correlations.



COMPACTION RESULTS

Continued from page 204

temperatures lower than those specified. For example, the mix was lowered from a 300-325 degree to a 280-300 range. These results pretty well demonstrate that the mix temperature is not as critical a factor as it has been previously thought, provided the high wheel load pneumatic tire roller is used.

Another good example of this was brought to light in 1958 during resurfacing of the Beltline Highway around the perimeter of Minneapolis. Because of the heavy traffic it handles, the contractor was required to open up the road as soon as possible. The original Marshall densities produced by the 30-ton roller exceeded specifications. But more interesting, even after heavy night traffic, the roller was still able to increase densities of the already compacted surface.

Other tests performed on stone base, stabilized base and subgrade materials add further evidence that a 8500-lb. wheel load, 30-ton pneumatic tire roller with proper range of tire inflation pressures do the job of producing uniform high densities required to support modern over-the-road truck-trailer traffic with minimum guesswork. And because of this, many state highway departments are considering or already have rewritten compaction specifications.

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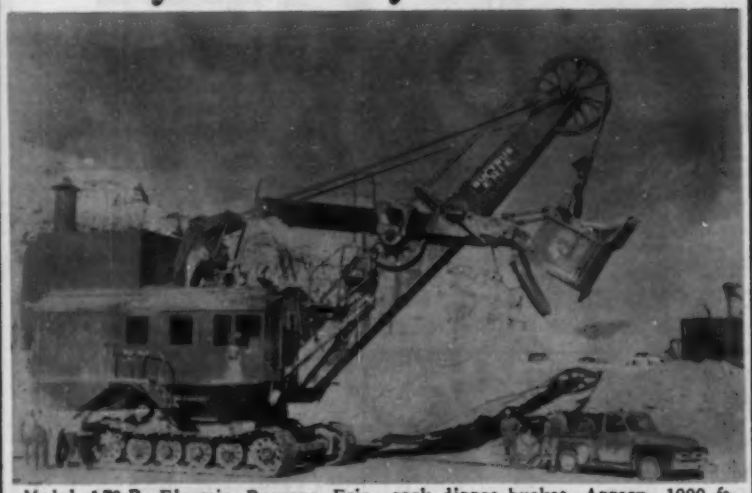

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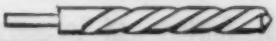

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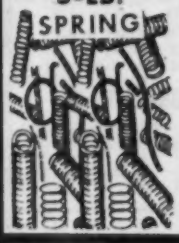

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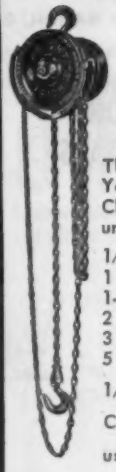

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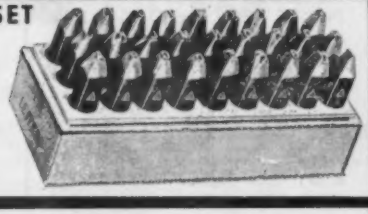

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¾ yd. MARION 35-M DRAG-CLAM with 70 ft. boom and GMC engine. Has 12 ft. 9 in. long crawlers, 10 ft. 7 in. wide with 36 in. pads. Full air controls with independent boom hoist and high gantry. 1958 model in excellent condition, located in Arkansas. #21959.

¾ yd. MARION 32-M DRAGLINE with 45 ft. boom, Continental gas engine. Has power boom hoist, manual controls. Built in 1955 and in good condition. Srawlers are 11 ft. 4 in. long, 9 ft. 11 in. wide with 25 in. pads. Located in Ohio. #21369

¾ yd. MARION 35-M SHOVEL with 18 ft. 8 in. boom and 16 ft. 4 in. handle. GMC engine, power boom hoist, 5150 lbs. ballast. Crawlers are 11 ft. 4 in. long and 9 ft. 11 in. wide with 25 in. pads. Full air controls and in excellent condition, 1956 model, located in Kansas. #21731

2½ yd. P&H 655 DRAGLINE with 17 ft. long, 12 ft. 4 in. wide crawlers, 75 ft. boom. Has Caterpillar engine and Kohler light plant. Good condition, 1946 model, located in Pennsylvania. #7957

2½ yd. BUCYRUS-ERIE 54-B SHOVEL-DRAGLINE with 85 ft. drag boom and 42 ft. shovel boom with 36 ft. handle and 2 yd. dipper. Has Caterpillar engine, high gantry, manual controls, running boards all around and Kohler light plant. Good condition, 1947 model, located in Pennsylvania. #41735

2½ yd. P&H 955-A SHOVEL. Powered by Waukesha engine. Has 15 ft. 7 in. long, 12 ft. 6 in. wide crawlers. Kohler light plant and extra parts—in good condition, new in 1951. Located in Arizona. #14944

3½ yd. MARION 111-M SHOVEL with 43 ft. boom, 34 ft. handle. Powered by GMC diesel engine. 30 ft. long, 15 ft. wide crawlers. Has high gantry, Kohler light plant, in fair condition, new in 1947. Located in Pennsylvania. #8697.

¾ yd. MARION 35-M HOE with 30 ft. boom, Amsco dipper with 30 in. side cutters, GMC engine, air controls, power boom hoist. Excellent condition, new in 1956. Located in Virginia. #21676

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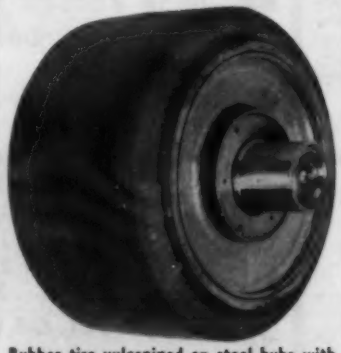

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Euclid 49 FD 6935	15 tons	Hazelton, Pa.	1947
Euclid 49 FD 8984	Water Wagon	Indianapolis, Ind.	1947
Euclid 49 FD 7761	15 tons	Indianapolis, Ind.	1948
Euclid 49 FD 8179	15 tons	Indianapolis, Ind.	1948
Euclid 49 FD 6753	15 tons	Indianapolis, Ind.	1947
Euclid 49 FD 7471	15 tons	Indianapolis, Ind.	1948
Euclid 63 TDA 21201	22½ tons	Ogden, Utah	1957
Euclid 63 TDA 21709	22½ tons	Ogden, Utah	1957
Euclid 63 TDA 21708	22½ tons	Ogden, Utah	1957
Euclid 49 FD 10108	15 tons	Indianapolis, Ind.	1951
Euclid 23 FDT 4347	33 yd. Coal Hauler	Indianapolis, Ind.	1945
Euclid 23 FDT 4387	33 yd. Coal Hauler	Indianapolis, Ind.	1945
Euclid 20 TD 10583	22½ tons	Boise, Idaho	1950
Euclid 20 TD 10591	22½ tons	Boise, Idaho	1950
Euclid 20 TD 10830	22½ tons	Boise, Idaho	1950
Euclid 20 TD 10837	22½ tons	Boise, Idaho	1950
Euclid 20 TD 10581	22½ tons	Boise, Idaho	1950
Euclid 32 TD 11475	22½ tons	Boise, Idaho	1951
Euclid 20 TD 10582	22½ tons	Coeur d' Alene, Ida.	1950
Euclid 20 TD110836	22½ tons	Coeur d' Alene, Ida.	1950
Euclid 20 TD 10588	22½ tons	Coeur d' Alene, Ida.	1950
Euclid 20 TD 10835	22½ tons	Coeur d' Alene, Ida.	1950
20 TD 10589	22½ tons	Leesburg, Alabama	1950
20 TD 10828	22½ tons	Leesburg, Alabama	1950
20 TD 10831	22½ tons	Leesburg, Alabama	1950
Euclid 20 TD 10589	22½ tons	Birmingham, Alabama	1950
Euclid 20 TD 10828	22½ tons	Birmingham, Alabama	1950
Euclid 20 TD 10831	22½ tons	Birmingham, Alabama	1950
Mack LRIS 1099D	15 ton	Providence, R. I.	1950
Mack LRIS 1159D	15 ton	Providence, R. I.	1950
Mack LRIS 1185D	15 ton	Providence, R. I.	1951
Mack LRIS 1186D	15 ton	Providence, R. I.	1951
Mack LRIS 1046D	15 ton	Indianapolis, Ind.	1949
Dart 10 SUG 57037	10 ton Underground	Worcester, Mass.	1957
Dart 10 SUG 57038	10 ton Underground	Worcester, Mass.	1957
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Dart 10 SUG 57052	10 ton Underground	Worcester, Mass.	1957

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HD-14	034476	Roller Shell D.F.	67.03	26.81
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for all model Cats—I.H.—A.C.
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LOWBOY TRACTORS

'55 GMC, W634, tandem, 8 spd, B Ranger, new 503 cu. in. engine, A-1 condition.
'50 Hendrickson tandem, 2-spd aux. trans., 450 cu. in. engine. Priced to sell.
'51 GMC, HCW632, tandem, 5 spd, 502 cubic inch engine, tractor equipped.
'49 GMC, D953, diesel, 6-71 overhauled engine, Acme tag axle, 10:00x22 tires.
'49 GMC, D753, diesel, 6-71 motor, 5 spd, 2 spd, Acme tag, 10:00x20 tires.
'55 GMC, MW503, 3 spd, aux., 9-yd tandem dump.
'50 GMC, MW503, 2 spd aux., w/9 yd tandem dump.
'55 Ford F-6, V8, 2 spd, 4-5 yd dump.
'49 IHC K-7 dump w/lowboy tag trailer.
'55 Mack, B-61, tandem diesel, with 18-yd twin telescopic tandem dump trailer.
'55 GMC, 630, tractor, w/air, 503 engine, 10 spd, B Ranger. Special price $2,750.

75 gas and diesel tractors
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I-R 160 on Ford Truck (Gas).
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JOY TWM 5 Challenger Drill.
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38' NORTHERN Portable Conveyor.
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1—Bros Model 450 Compaction Roller, 50 Ton
1—Ferguson Model 400A Compaction Roller, 200 Ton
2—Rex 160 Single Pumpcretes—25 HP Electric
1—Telesmith Hercules Washing Screen—60″ x 19′
1—Symons Norberg Rod Deck Screen—5′ x 10′—10 HP—220/440V
1—Joy 600 CFM Portable Compressor, Model DBMS-1—Diesel
1—Joy Challenger Drill, TWM5—TM 500
2—Fairbanks-Morse 8″ Centrifugal Pumps—200 HP—220/440V
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70 MM—$17.50 Each
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Crane Booms - all sizes. Shovel Fronts. Backhoes. N. W. 6 & all other type machines.
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QUALITY PRODUCT

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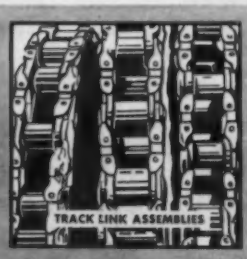
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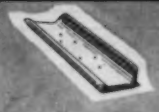
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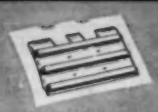
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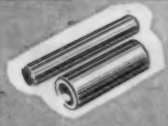
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New - Used, Excellent Condition - Available Now

BACKHOES

Bucyrus-Erie 22-B, ¾ yd. Good.
Marion 372, New, 2 yd. machines, will fit other 1½ yd. to 2 yd. machines.
Osgood 200, ½ yard, straight and camel back, complete. New.
PGH 255A, ⅜ yard. New. Chain Crowd, Straight Type.
PGH 255A, ¾ yard. New Camel Back.
PGH 855 BLC Camel Back, 2 yard. New.
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American 375-B, ¾ Camel Back. New.
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Link-Belt LS85. New.
Lorain 820 Camel Back, complete.
Bay City, 65 yd. and 1¼ yd. New.
⅜ths yd. Backhoe Bucket with Stick. New.

CRANE BOOM

Bucyrus-Erie 22B - 35'.
Bucyrus-Erie 22B, 20' Sections - New.
Lima 1201 - 15'; Jib & Mast. New.
Lima 604 Jib, 10'. New.
Link-Belt K-360, K-370, 70'. Excellent.
Lorain 41, 25'. New.
Lorain 80, 82, 820, new.
NW-18. 25'. New.
Osgood 200, 25'. New.
Manitowoc 2000B, 45 feet, new, 3000B, 20' jib, New.
Lima 604-750. 34, like new.
NW-6, 45'. New.
M-49. Shield Bantam.
American 375 BC, 35', like new. Priced to sell. We will adapt to fit other ¾ yd. machines.
Link-Belt HC 70, 35' boom. NEW.
Marion 372 - 15' Jib; New.
Marion 352, 1¼ yd., 40' boom. NEW.
PGH 150 - 30'. New harness and hogline.
PGH 655 - 50'. New.
PGH 655, 20' Jib. NEW.
PGH 255ATC, 80', complete w/harness and hogline. NEW.
Unit 1020 - Harness & Hoglines. New.

SHOVEL FRONTS

Bay City 37, ¾ yd. Good.
Bay City 65, less bucket. Good.
Bucyrus-Erie 10-B, ⅜ yd. New.
Bucyrus-Erie 15-B. New.
Bucyrus-Erie 22-B, ¾ yd. New.
Bucyrus-Erie 37-B, 1½ yd. Good.
Bay City 20, ⅜ yd. Good.
Buckeye 70 and GarWood 20A. New.
GarWood 75-B ¾ yd. New.
Koehring 701, 2-yd. New.
Koehring 304, with chain, like new.
Lima 604, 1½ yd. Good.
Lima 34, ¾ yd. New.
Lorain TL-25 - New.
Lorain 820, 2½ yd. Complete, like new.
Lorain 40, ¾ yd. Complete. New.
Lorain 50, Complete, Excellent Condition.
Link-Belt LS-75. Good.
Manitowoc 2000B - New.
Insley K-12, ½ yd. New.
Osgood 200. Complete, NEW.

BOOM SECTIONS

In Various Lengths - Inquire

Bay City 180M.
Bucyrus-Erie 15B, 22B, 37B, 44B.
Buckeye 70.
Browning T15C.
GarWood M20A, M20B.
Koehring 304, 304TC.
Lima 603, 604, 802.
Link-Belt LS-75, LS-85, LS-90.
Link-Belt K-360, K-370.
Lorain TL25, 80, 820.
Manitowoc 2000B, 3000B.
Marion 362, 372.
Michigan - All Models.
Northwest 25, 71, 8.
Unit 1020.
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P&H, all models.
NW 25, 6, 71, 8.

NEW FAIRLEADS AVAILABLE

American 375B; Bay City 45, 65; Bucyrus-Erie 15B and 22B and 37B; Garwood 75B, M20A; General 307; Lima 604, 34; Lorain MC4, MC414, 416, L-40 or 41; Lorain 80, 82, 820, 85 - Northwest 6 - Osgood 50, 200 - Orton 22G; Byers 83, Unit 1020.

New Bucyrus-Erie 15B, 20B and 22B. Special - Far Below Market.
Koehring 304, Revolving Type. Special - New.

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Diesel Engines - Fork Lifts
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Loaders - Backhoe Combinations
Crawlers - Rubber-tired Units

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Shovels - Cranes - Draglines
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SHOVELS DRAGLINES EUCLIDS

7400 Marion Electric Drag, 12 yd.
2400 Lima Electric Drag, 6 yd.
2400 Lima Diesel Drag, 6 yd.
4500 Manitowoc Diesel Drag, 5 yd.
151-M Marion Electric Shovel, 5 yd.
80-D Northwest Diesel Shovel, 2½ yd.
95 Northwest Diesel Drag, 2½ yd.
100-B Bucyrus-Erie Electric Shovel, 4 yd.
54-B Bucyrus-Erie Dragline, 2½ yd.
3500 Manitowoc Dragline, 2½ yd.
1007 Osgood Dragline, 2½ yd., $12,500.
22-B Bucyrus-Erie Shovel & Hoe, ¾ yd.
Dozers: D7's - D8's - D9's.
Euclids: Rear dumps & bottom dumps.
Attachments for some machines.

FRANK FAMALETTE EQUIPMENT CO.
P. O. Box 325 Hazleton, Pa.
GL 5-4708 - GL 5-4196

FOR SALE

One Model 38B Bucyrus-Erie combination Dragline and shovel complete with General Motors diesel engine, torque converter, independent boom hoist, 33" shoes and 1¾ yard HENDRIX Dragline bucket. This machine used less than 1,000 hours. Perfect in every respect. Will finance. A real bargain.

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1033 West Mississippi, Denver, Colorado

H & G STEEL SHEET PILING

STOCKS TORONTO, BUFFALO, BOSTON, BALTIMORE, NEW YORK, JACKSONVILLE, NEW ORLEANS, MIAMI

528 Pos. BP-12—BP-10—35' to 60'
550 Pos. ZP-22—25, 30, 35, 55', 60'
570 Pos. ZP-27—ZP-32—20', 25' 40' & 60'
600 Pos. DP-5—25', 60' 45', 40' & 30'
1700 Pos. SP-4—60', 55', 45' & 40'
1200 Pos. SP-6A—60', 45', 40' & 20'
500 Pos. AP-3—60', 30', 25' & 20'

DIESEL LOCOMOTIVES

18 Gen. Elec. 100, 80, 65, 45, 25 & 20 Ton
4 Whitcomb 8 ton & 15 ton
1 Brownhoist 60' Boom, Cat. Diesel

R. C. STANHOPE, INC.
Telephone MU. 2-5975
60 E. 42 St. New York 17, N. Y.

Manufacturers' Literature

DIESEL MAINTENANCE: A New 24-page booklet on diesel engine maintenance has been prepared by Cummins Engine Company, Inc., Columbus, Ind. The booklet, "Ten Maintenance Steps," tells power users how to increase equipment availability, reduce operating costs and obtain better engine performance. Chapters covered in the booklet include: 1. Keep Dirt Out of the Engine; 2. Maintain a Lubricating Film on All Bearing Surfaces; 3. Regulate the Engine's Fuel; 4. Control Operating Temperatures; 5. Guard Against Corrosion; 6. Let the Engine Breathe; 7. Prevent Overspeeding; 8. Know Your Engine's Condition; 9. Correct Troubles While They Are Simple; 10. Schedule and Control Your Maintenance.

For more details circle 157 on Enclosed Return Postal Card.

ELECTRIC PLANTS: A special folder, listing their entire line of gasoline engine-driven electric generating plants, has been announced by D. W. Onan & Sons Inc., Minneapolis, Minn. These compact, completely self-contained generator sets are said to provide a dependable, independent source of electricity for primary power, where high-line power is inconvenient or unavailable; for standby power and for portable or mobile power for the operation of electric tools, appliances or lighting. The folder lists each series of plants (both air and water-cooled) in detail, with specifications for both engine, generator and controls outlined to make it comparatively simple for the reader to select the proper type of generating plant to suit particular needs.

For more details circle 158 on Enclosed Return Postal Card.

SOILS TESTING & ENGINEERING SERVICES: A new brochure describes the complete range of soils and foundation testing services offered by ATEC, the American Testing and Engineering Corporation, 5204 E. 25th St., Indianapolis, Ind. The brochure was prepared for engineers, architects and contractors. It is fully illustrated to show typical ATEC boring, sampling and testing procedures. Sample reports demonstrate how ATEC engineers analyze and correlate test data obtained from field and laboratory to help solve design and construction problems. Specialized ATEC engineering services, which include the design of natural earth structures, compaction control, construction inspection and concrete testing, are described in detail.

For more details circle 159 on Enclosed Return Postal Card.

SICKLE BAR MOWERS: The special capabilities of sickle bar mowing equipment and the three machines of this type manufactured by Jari Products, Inc., 2970 Pillsbury Ave. S., Minneapolis 8, Minn., are featured in a four-page brochure issued by this company. Jari mowers include the Monarch, for heavy-duty daily use; and the Champion, a heavy-duty mower that can be converted with attachments for year-around maintenance. All are self-propelled. Attachments for the Champion, which are pictured and described in the folder, include a rotary snow thrower, reel lawn mower, tiller-cultivator and a power sprayer. Applications and specifications for the mowers are also listed.

For more details circle 160 on Enclosed Return Postal Card.

POWER TOOL CATALOG: Syntron Company, 849 Lexington Ave., Homer City, Pa., announces the recent publication of a new four-page catalog section of portable construction tools. The

section includes specifications, data and illustrations of the complete line of Syntron self-contained electric hammers and hammer drills, featuring automatic drill bit rotation. The section also contains illustrations and information on the company's self-contained gasoline hammer paving breakers, rock drills, concrete vibrators, and vibrating floats. Free copy immediately available upon request from Syntron Company, 849 Lexington Avenue, Homer City, Pennsylvania.

For more details circle 161 on Enclosed Return Postal Card.

SUBGRADER ATTACHMENT: A deep cut attachment is one of many features of a precision subgrader described in new literature, No. 2652, now available from Blaw-Knox Company, 300 Sixth Avenue, Pittsburgh, Pa. This optional equipment is designed for air base work and offers cutting depth range from 12 to 24 inches. The attachment is for installation on GB and GC models. Other features of the subgrader, which excavates through vibration, include: Two ranges of excavating widths for single or dual lane paving, fully adjustable strike-off, quick adjustable crown control, self-powered reverse travel, and fingertip hydraulic depth controls. Additional optional equipment includes split conveyor flights, extra long discharge horn, pneumatic transportation wheels, and rubber traction wheels.

For more details circle 162 on Enclosed Return Postal Card.

T-18 SYNCHRO-TAMPER: Stow Mfg. Co. has published a bulletin explaining the new Stow T-18 Synchro-Tamper. The unit, which synchronizes the engine stroke with the vibrator is described and completely illustrated in the literature. Included are detailed specifications. For a copy, write to Stow Mfg. Co., 312 Shear St., Binghamton, N. Y.

For more details circle 163 on Enclosed Return Postal Card.

DIESEL-POWERED ELECTRIC PLANTS: A booklet announcing the new "Kohler Trio," a series of diesel engine powered electric plants, has been published by Kohler Co., Kohler, Wis. The new 2,000, 5,000 and 7,500 watt diesel electric plants feature fuel economy and quick, cold weather starting, assured by the engine's direct injection combustion system, states the manufacturer.

For more details circle 164 on Enclosed Return Postal Card.

TRACTOR FOR GROUNDS MAINTENANCE: Action photos in this eight-page booklet show versatility of Ford Tractors and equipment for roadside and park mowing, mulching, street and parking lot cleaning and snow removal, landscaping, and other grounds maintenance jobs. Booklet is available from Industrial Sales Department, Tractor and Implement Division, Ford Motor Company, 2500 E. Maple, Birmingham, Mich.

For more details circle 165 on Enclosed Return Postal Card.

35 TON ROLLER: A four-page, illustrated folder from Shovel Supply Company, 4900 Hines Blvd., Dallas 21, Texas, describes the Ferguson 35-ton roller. With ground clearance of 13 in., the roller has 7 wheels and a rolling width of 8 ft. Empty weight is 21,700 lb., ballasted weight, 70,000 lb. There are three speeds forward and reverse, with full oscillation of all wheels, front and rear.

For more details circle 166 on Enclosed Return Postal Card.

SEWER PIPE: A new four-page folder describing Republic Free Flow Sewer Pipe is now available from Republic Steel Corporation, Advertising Division, 1441 Republic Building, Cleveland 1, Ohio. The folder lists the advantages gained by coating the interior of riveted corrugated metal pipe with a smooth asphalt lining. Descriptions and guide specifications for the pipe made from either Republic copper steel or asbestos zinc-clad culvert sheets are included, along with tables showing the relationship between sewer loadings and gages of metal pipe. Request Adv. 1101.

For more details circle 167 on Enclosed Return Postal Card.

GYRATORY TESTING MACHINE: A four page folder explains in graphic form a gyratory testing machine from Engineering Developments Co., Inc., P. O. Box 984, Vicksburg, Miss. The unit is designed for bituminous mixtures, soils and base course materials testing; it indicates optimum bitument content directly from chart recordings called Gyrographs. The unit employs the basic Texas Gyratory principle and serves the dual function of kneading compactor and testing machine.

For more details circle 168 on Enclosed Return Postal Card.

MAINTENANCE OF SEATS: A booklet available from the Bostrom Corporation 133 W. Oregon St., Milwaukee 4, Wis., explains with diagrams and photographs the simple steps for good preventive and corrective maintenance of "Level Ride" 80 torsion spring suspension seats. The manual shows how the company's suspension seat will last longer with the minimum of care and maintenance required for the moving parts. Points of possible eventual wear are pointed out and the easy replacement procedures clearly detailed.

For more details circle 169 on Enclosed Return Postal Card.

PIPE AND PIPE ARCH: A new catalog is available from Armco Drainage & Metal Products, Inc., Product Information Service, Middletown, Ohio, concerning its corrugated metal pipe and pipe-arch. Advantages are described and tips given on making the correct selection for the application. The booklet contains tables, brief data on the various types of structures, and information about joints and fittings and proper installation methods. Ask for Catalog CMS-5859.

For more details circle 170 on Enclosed Return Postal Card.

AIRCO ISSUES BROCHURE ON INSPECTION OF WELDED BRIDGES: Air Reduction Sales Company has issued an eight-page reprint of an article entitled "A Guide for Inspection Methods for Welded Highway Bridges", by La Motte Grover, welding engineer. The article which appeared originally in *Roads and Streets* magazine describes the scope and content of the Highway Research Board's forthcoming publication on the same subject.

The brochure will acquaint state highway bridge and construction engineers, railway bridge engineers and county and municipal engineers with developments in the field of welded bridge construction and the recommendations of the American Welding Society for work in field inspection. For a copy, write Air Reduction Sales Company, a division of Air Reduction Company, Inc., 150 East 42nd Street, New York 17, New York. Specify Form ADR 122.

For more details circle 171 on Enclosed Return Postal Card.

PROPER GROUTING PRACTICES: Shrinkage is the principle cause of grout failure. Explaining how to avoid this shrinkage through the use of properly applied non-shrink grout is the subject of a 16-page publication from Master Builders Company, Cleveland, Ohio. Describing successful grouting techniques with "Embeco" non-shrink grout, the bulletin outlines and illustrates common methods of grouting different types of equipment, the mixing and placing of grout and cold and hot weather grouting.

For more details circle 172 on Enclosed Return Postal Card.

HEAVY DUTY CHAIN DATA: A new technical folder has been released on heavy duty roller chain by Atlas Chain & Manufacturing Company, Dept. F.O. West Pittston, Pa. This folder is on the Atlas Offset Side Bar Roller Chain which has been developed for applications where operating conditions are severe. Literature gives full details on the chain, drawings of its construction as well as sizes available and sprockets to be used with it.

For more details circle 173 on Enclosed Return Postal Card.

With the Manufacturers

FWD CORPORATION has recently consolidated two of its sales departments as a further step in the company's accelerated marketing program. The announcement was made by G. F. DeCoursin, marketing vice president.

JOHN P. BANK has been appointed national service manager of Thor Power Tool Company, it was announced recently by Neil C. Hurley Jr., president of the Aurora, Ill. portable tool manufacturing firm. Bank, a field service engineer and former works manager of the firm's main plant in Aurora, will be in charge of expansion and improvement of Thor service and repair operations in the United States and Canada.

TWO AEROQUIP EXECUTIVES have been named to key positions it was announced recently by Peter F. Hurst, president. Lloyd Jones Jr. is now manager of the firm's General Logistics Division and Victor Emory is general sales manager of the Industrial Division.

WILLIAM F. MARTIN was recently appointed director of manufacturing services for Borg-Warner Corporation. Prior to this appointment, he was vice president in charge of manufacturing for B-W's Byron Jackson Division. Mr. Martin has been with Byron Jackson since 1956 when he entered the firm as a manufacturing engineer.

ROBERT R. SCHULTZ who has been associated for 25 years with the crushing, mining and road machinery industries, died recently at his home in Joplin, Mo. For the past nine years he had been vice president and general manager of the Rogers Iron Works Company, Joplin, Mo.

GM DIESEL'S 1960 SERVICE SCHOOL schedule has been announced by Chester B. Clum, general service manager for the division. Programs of one, two and three weeks covering construction, operation and maintenance of GM diesel engines have been planned and scheduled throughout 1960. Copies of the 1960 schedule can be obtained from GM Diesel distributor's and dealers.

BUCYRUS ERIE CO. has as its new sales sales manager for blast hole drills William G. Barnes. Barnes, who joined Bucyrus-Erie in 1956 as a sales representative on the Mesabi iron range, has been sales engineer for blast hole drills since fall, 1958.

THE HARNISCHFEGER CORP., Milwaukee, Wis., known for its "P&H" trademark, is in the process of decentralizing its sales organization in order to achieve closer relationship between field activity and management. New sales divisions will divide the United States into three major areas, and a sales manager position will be established for each area.

Index to Advertisers

Special report to Caterpillar D8 Tractor owners:

CAT CATERPILLAR

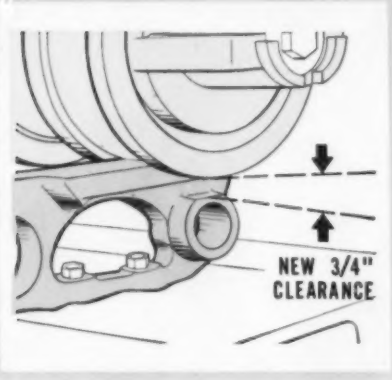
Parts you can trust
Dependable round-the-clock service

NEW TRACK COMPONENTS AVAILABLE FOR MOST D8 TRACTORS... GIVE UP TO 44% LONGER LIFE

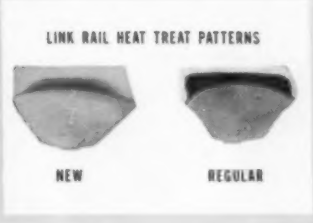
Caterpillar's continuous research and testing pay off for you with the development of superior D8 track components. The next time you replace track parts, specify these new components. They last longer and require less maintenance. Here's what's available for 2U, 13A, 14A and 15A tractors:

30% STRONGER PINS AND BUSHINGS have more wear area to extend life. The big track pins are ¼" larger in diameter and heat-treated deep to resist wear . . . pins will not bend and cause uneven wear. The large contact areas of the bushings are hardened deep, both inside and out. Under field conditions these bushings have lasted up to 44% longer than regular bushings.

• • •



STRONGER, LONGER, HIGHER TRACK LINKS are 3 lb. heavier, 1" longer and ¼" higher. New length means fewer track sections are required. Increased height gives up to ¼" more *link pin boss-roller flange* clearance. Improved steel used in these links permits 80% deeper rail hardening and greater strength —pins and bushings stay tight *in the links* even under the roughest application.



• • •

NEW TRACK SHOE GROUSERS ARE 20% THICKER at the tip and are hardened much deeper than on regular shoes. The new shoe as a whole is bigger and heavier to resist bending, impact and wear. Track hardware used with the new track components is stronger—bolt diameter increased from ¾" to ⅞".

• • •

NEW DESIGN BORALLOY SPROCKET REPLACEMENT RIMS are available to accommodate the increased pitch of the longer links and bigger track bushings. Teeth are precision-machined to provide exact fit with track bushings—a major contribution to longer bushing life.

SEE YOUR CATERPILLAR DEALER for more information on extending your D8 track life. He has parts you can trust and round-the-clock service. See him today.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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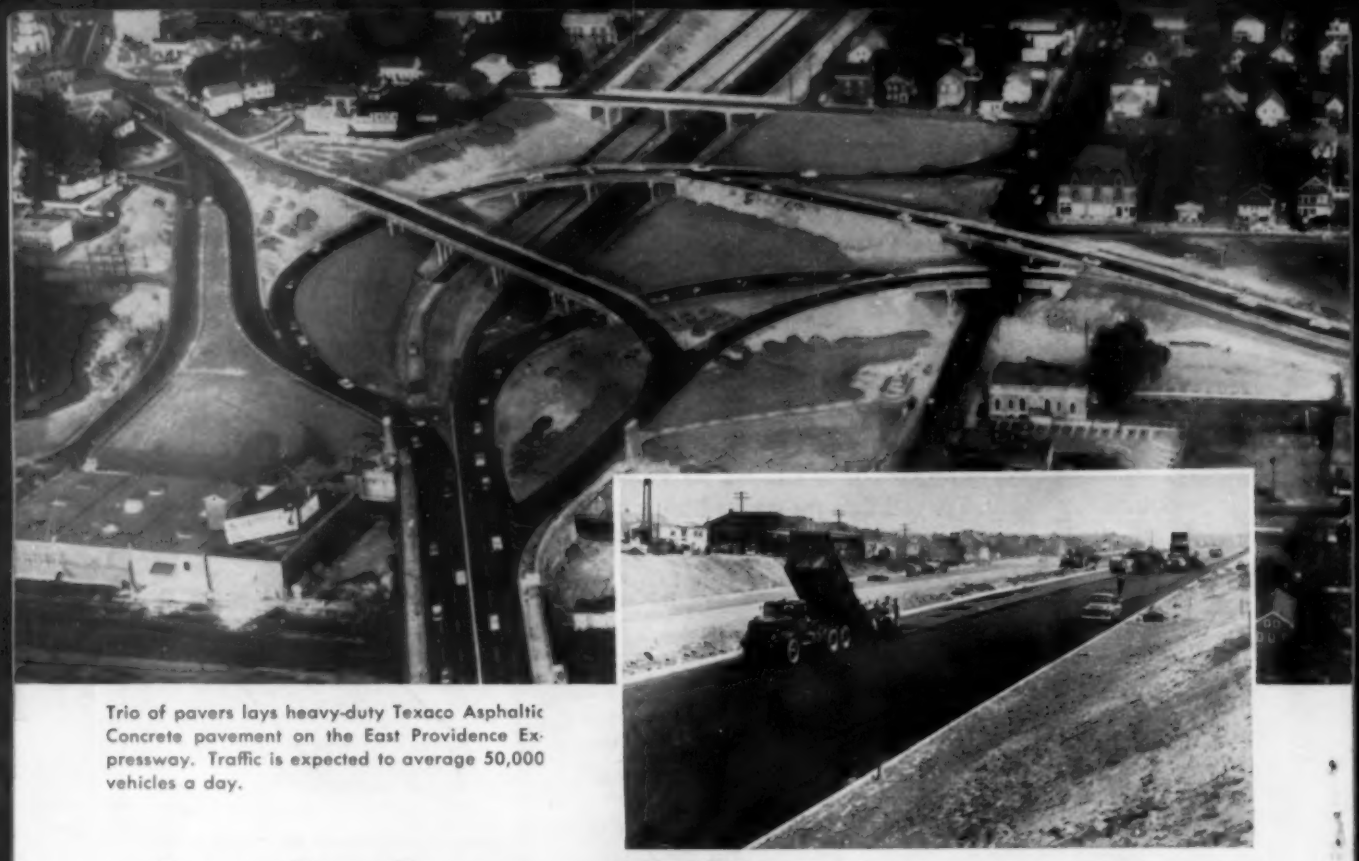

Trio of pavers lays heavy-duty Texaco Asphaltic Concrete pavement on the East Providence Expressway. Traffic is expected to average 50,000 vehicles a day.

Asphalt-paved expressways expedite Providence traffic

Steady progress is being made toward solving the traffic problem of Providence, R. I., by the construction of a comprehensive system of modern expressways.

Texaco Asphalt plays two important roles in the resilient, heavy-duty pavement constructed on two of these busy traffic arteries. Both the East Providence Expressway and the East Shore Expressway have a 3-inch surface of hot-mix Texaco Asphaltic Concrete. The upper 2½ inches of the base is Texaco Asphalt (Penetration) Macadam, laid on 5½ inches of sand-filled macadam. Underneath is a 12-inch gravel subbase.

This highly durable type of Texaco Asphalt construction, with its low upkeep cost, and its skid-resistant, glare-free surface, has a substantially lower first cost than rigid paving designed for the same traffic. When used on primary highways, particularly in the construction of Interstate Highways, the Providence expressway type of Asphalt pavement makes possible more miles of paved roads for the taxpayer's dollars.

Today, more than ever before, highway officials cannot afford to overlook the greater economy of heavy-duty Asphalt paving.

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